U. S. Government RESEARCH REPORTS

November 18, 1960
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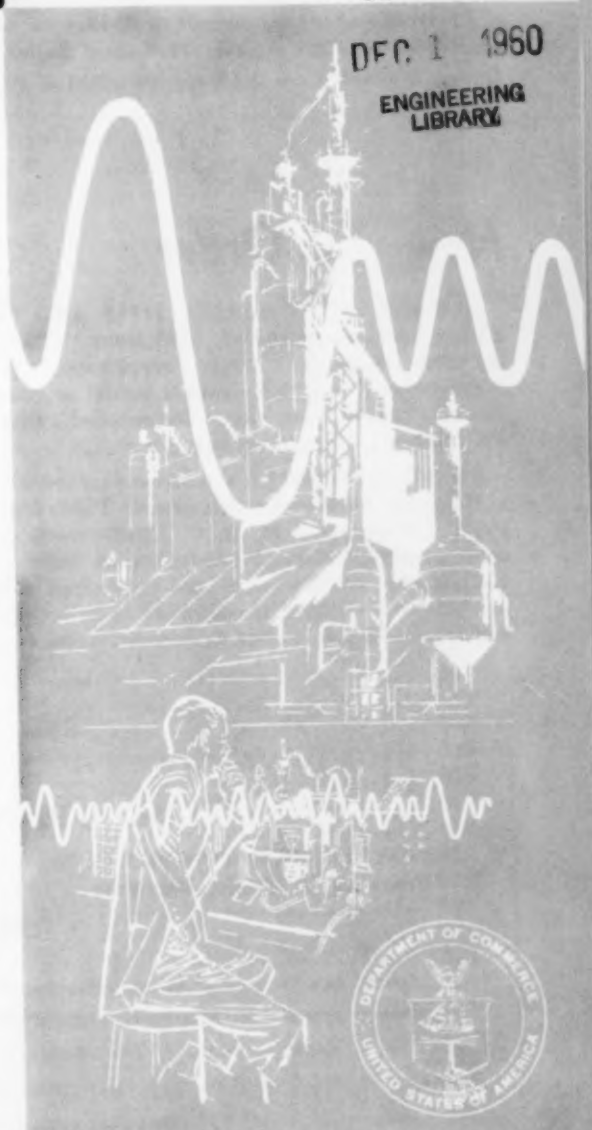

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BIBLIOGRAPHY

Platinum and allied metals. July 60. 8p. (OTS SB-420) 10 cents 623

BEHAVIORAL SCIENCES

Accuracy of information on line work orders for armament-electronics maintenance. Dec 58. 40p. (PB 151 705) $1.00 525
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Micro-module production program. 1959. 157p. (PB 161 911) $3.00 579

ENGINEERING (con.)

Programming of digital computers for determination of stability and control characteristics. Volumes I and II. July 59. 596p. (PB 161 924) $7.00 557
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MISCELLANEOUS

Report of NRL Progress. Sep 60. (PB 161 285) $1.25, $10.00/year 651
Report of NRL Progress. Oct 60. (PB 161 286) $1.25, $10.00/year 652

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Calibration of five gamma-emitting nuclides for emission rate. Aug 60. 23p. (PB 161 572) 75 cents 630
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Literature survey of concretes for nuclear radiation shielding. June 60. 29p. (PB 161 910) 75 cents 630
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PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Development of techniques for the evaluation of high altitude pressure suits. Dec 59. 130p. (PB 161 899) $2.75 630

Amplitude and phase of the low- and very-low-radio frequency ground wave. June 60. 43p. (PB 161 561) 75 cents 649
Investigation of physical properties of semiconductors. Apr 60. 53p. (PB 161 903) $1.50 642
Proceedings of the 1960 conference on the propagation of E. L. F. radio waves held 26 January 1960. June 60. 27p. (PB 161 562) 75 cents 649
Study of free convection boundary layer oscillations and their effects on heat transfer. Dec 59. 42p. (PB 161 941) $1.25 645

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U. S. DEPARTMENT OF COMMERCE

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

OFFICE OF TECHNICAL SERVICES

Vol. 34, No. 5 Pages 523 - 671 November 18, 1960

BIBLIOGRAPHY

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
SPACE TECHNOLOGY: A PARTIAL SEARCH OF THE LITERATURE CONCERNING THE APPLICATION OF ORBITAL SPACE SATELLITES TO ADVANCED WEAPONS SYSTEMS, by Alfred M. Anzalone. Oct 59, 109p. 238 refs. F. R. E. L. Literature Search no. 9 pt. 1; AD-231 822.
Order from LC mi$5.70, ph$16.80 PB 149 150

Part I of this report contains a preface and a Uniterm index in addition to a list of annotated references. The Uniterm index includes subjects, contracts, projects, item designations, and personal authors.

Raytheon Co., Waltham, Mass.
PARTIAL FUEL GAGE BIBLIOGRAPHY. Rept. on Contract AF 33(038)22632. [1952] 99p. 233 refs. ATI-163 321.
Order from LC mi$5.40, ph$15.30 PB 150 301

This report released for sale to the public 19 Sep 60.

Selected patent classes and selected files of journals were searched, with a view to determining the amount of material present, and the resources required to assemble it into a useful critical bibliography. About five percent of the applicable U.S. and foreign patent classes were searched, and perhaps ten percent of the American, English, and German literature was surveyed carefully. The U.S. patents searched covered fuel gages other than float types. The foreign patents included those classes (British Group XIX, German Klasse 42(c), Gruppen 26-30, and French Group XII(3) directly concerned with aircraft fuel quantity gages. The Anglo-American and German literature was skimmed for both fuel gages themselves, and for flowmeter theory and practice.

ASTRONOMY

Astrophysics

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
STUDIES OF RATE OF ACCRETION OF INTERPLANETARY MATTER BY THE EARTH, by Fred L. Whipple and Paul W. Hodge. Final rept. on Contract AF 19(604)1901. 4 Apr 60, 31p. AFCRC-TR-60-253.
Order from LC mi$3.00, ph$6.30 PB 147 552

The problems of how much material the earth accretes and in what precise way the accretion occurs have not yet been solved. To solve them, we must learn as much as possible about both the falls of large meteorites and the accretion of meteoritic particles and dust. Our first investigation involved an exhaustive survey of the soil around the Arizona Meteorite Crater In the soil, we found numerous tiny meteoritic particles (approximately 100 microns in diameter). The total mass of the original meteoritic material which these particles represented was estimated to be 12,300 short tons. Our second attack on the problem involved the collection of armospheric dust by various types of high-flying vehicles, and the search for the meteoritic component of this material. Preliminary results indicate that the amount of terrestrial dust at heights of 50,000 feet and more is somewhat greater than many investigators have supposed and that the probable influx of meteoritic particles into the earth's atmosphere is smaller than the values generally quoted.

Kiruna Geophysical Observatory (Sweden).
A SWEPT FREQUENCY INTERFEROMETER FOR 35 - 65 Mc/s, by Bengt Hultqvist. Technical summary rept. Task 4, 15 Oct 57-15 Oct 59, on Contract AF 61(514)1314, 20 Oct 59, 42p. 8 refs. AFCRC-TN-60-146.
Order from LC mi$3.30, ph$7.80 PB 148 808

The swept-frequency interferometer is described and its most important properties are discussed. The records obtained in single frequency and swept frequency operation are analyzed with regard to the influence of the length of the base line and the declination of the radio source. For the swept-frequency record formulas are given for the slope of the interference ridges, the number of interference maxima, frequency difference between consecutive interference maxima, the rate of increase of the number of maxima and the frequency of the first harmonic of the low frequency signal. The development work performed on the interferometer is described. (Author)

Minnesota U. School of Physics, Minneapolis.
GAMMA-RAY BURST FROM A SOLAR FLARE, by L. E. Peterson and J. R. Winckler. Technical rept. no. 2.12 Cosmic Ray Intensity at High Altitude, Contract [Nonr-710(19)]. Dec 58, 27p. 17 refs.
Order from LC mi$2.70, ph$4.80 PB 148 796

An observation was previously reported of a burst of high energy radiation during a cosmic ray balloon flight in time coincidence with a class II solar flare. The burst has been interpreted as Bremsstrahlung γ-rays of about 0.5 Mev, from electrons accelerated to 1.0 Mev during the growth of the flare stopping in the solar photosphere. These same electrons, spiralling in the intense magnetic fields of the flare region, can account for solar radio bursts at 3 cm and 21 cm by betatron radiation. The observations and their consequences are examined in greater detail.

Naval Ordnance Test Station, China Lake, Calif.
INFRARED RADIANT INTENSITIES OF THE SUN AND OF THE MOON IN THE 2- TO 6-MICRON REGION (MEASURED BY AN AIRBORNE RADIOMETER) by Gordon C. Augason. 3 May 60, 17p. 5 refs. NOTS TP-2443; NAVWEPS rept. 7050.
Order from LC mi$2.40, ph$3.30 PB 149 081

In the design and use of infrared-sensing devices, it is often necessary to consider the effects of direct and reflected sunlight on the studies to be made with that equipment. This report presents in graphic form measurements of radiation from the sun and from the moon. The measurements were recorded by an airborne radiometer sensitive in the 2- to 6-micron region of the spectrum. A method is given for using these data to determine the effects of the radiation, and a suggestion is made as to the possible use of such information. (Author)

Naval Ordnance Test Station, China Lake, Calif.
SEMINAR LECTURES ON CELESTIAL MECHANICS. 27 May 58, 201p. 39 refs. NOTS 2040; AD-232 080.
Order from LC mi$9.30, ph$31.80 PB 149 988

This report released for sale to the public 12 Sep 60

Contents:
Fundamental principles, by R. H. Olds
Rectilinear motion, by E. B. Mayfield
Central forces, by A. J. Jaske
Attraction of bodies, by W. A. Allen
Planetary motion (Problem of 2 bodies), by W. F. Koehler
Optimum launching altitude for a satellite, by A. Hibbs
Geophysical perturbations of an earth satellite, by L. Blitzer
Astronomical coordinate systems, by P. St.-Amand and J. G. Moore
Perturbations, by R.B. Leipnik
Determination of orbits, by W. C. White

Naval Research Lab., Washington, D. C.
MEASUREMENTS OF THE POSITIONS, FLUXES AND SIZES OF CELESTIAL RADIO SOURCES AT 10.2 CM, by R. M. Sloanaker and J. H. Nichols. Interim rept. 13 July 60, 24p. 29 refs. NRL rept. 5485.
Order from LC mi$2.70, ph$4.80 PB 146 037

The positions of eight bright discrete celestial radio sources at 10.2 cm have been measured with the U. S. Naval Research Laboratory 84-ft antenna to estimated accuracies of ± 1 min of arc probable error. For six of the sources, for which accurate optical positions are available, the measured radio positions coincide with the positions of the optical centers of the sources to within the uncertainties in the radio measurements. The equivalent gaussian diameters and flux densities were also determined. (Author)

Oklahoma State U. Research Foundation, Stillwater.
ACOUSTIC DETECTION OF METEORIC PARTICLES, by Richard F. Buck. Final rept. v. 1 on Contract AF 19(604)1908. 14 Apr 60, 162p. AFCRC-TR-60-272.
Order from LC mi$7.80, ph$25.80 PB 149 098

The technique used for detection has been based upon acoustic activation of suitable devices by the impact of such meteoric material upon metallic surfaces carried by high altitude rockets. Related laboratory investigations have been concerned with two general aspects of the basic investigation: the establishment of a working technique and verification of the validity of information obtained through this technique, and in a more indirect approach, a secondary series of investigations performed in order to establish the suitability of the specific electronic devices developed for use in the technique. Specific details regarding rocket experimentation are given for a number of rocket flights and an up-to-date tabulation of the data is included. A discussion of the problems of interpretation of the information acquired from each specific rocket experiment system accompanies the data.

Oklahoma State U. Research Foundation, Stillwater.
AN ANALYSIS OF ROCKET AND EARTH SATELLITE MEASUREMENTS OF MICROMETRIC INFLUX, by Curtis W. McCracken. Master's thesis. Final rept., vol. II, on Acoustic Detection of Meteoric Particles, Contract AF 19(604)1908. 14 Apr 60, 129p. 52 refs. AFCRC-TN-60-272.
Order from LC mi$6.30, ph$19.80 PB 149 099

The primary purpose of this paper is an attempt to attach a meaningful significance to recent measurements of micrometeoric influx, as determined by high-altitude rockets and Earth satellites. Other known data on meteoric influx are introduced to support the micrometeor data and to provide a framework onto which the

micrometeor data can be added in the analysis. Some of the data on meteoric influx, as well as the recent data on micrometeoric influx, suggest a major change in the mass distribution function from the function in prevalent use at the present time. (Author) (See also PB 149 098)

BEHAVIORAL SCIENCES

Human Engineering

Hearing and Communication Lab., Indiana U., Bloomington.
OPERATING CHARACTERISTICS, SIGNAL DETECTABILITY AND THE METHOD OF FREE RESPONSE, by James P. Egan, Gordon Z. Greenberg, and Arthur I. Schulman. Technical rept. on Research Concerning the General Problem of Information Reception by Means of Speech Communication, Contract AF 19(604)1962. 15 Dec 59, 87p. 7 refs. AFCRC-TR-59-58.
Order from LC mi$4.80, ph$13.80 PB 148 882

This paper is concerned with an experimental analysis of the following problem in signal detection: a weak signal of brief duration is presented a number of times in a long observational interval. The temporal intervals between the presentations of the tones are randomly selected, and the listener is not given any information as regards the distribution of these random intervals.

Naval Training Device Center, Port Washington, N. Y.
BIBLIOGRAPHY OF UNCLASSIFIED HUMAN ENGINEERING REPORTS. 1 Jan 56, rev. 1 Jan 58, 21p. 457 refs. NAVEXOS P-1491, supersedes same and supplement of 1956.
Order from LC mi$2.70, ph$4.80 PB 150 185

This report released for sale to the public 19 Sep 60.

For each report the following information is given: the author, report title, date of issue, security classification, and report number. The report titles are organized under broad subject matter titles.

Personnel and Training

Adjutant General's Office, Washington, D. C.
APTITUDE DISTRIBUTION IN THE COMBAT ARMS, by Robert F. Boldt and Dennis Seidman. Rept. on Combat Allocation a-31. Apr 60, 23p. 2 refs. Technical Research rept. 1119.
Order from LC mi$2.70, ph$4.80 PB 149 458

As a result of expressed concern that the quality of manpower being supplied to combat divisions was substantially below that being supplied to the rest of the Army, a study was undertaken to find how aptitude levels in combat divisions compared with aptitude levels in the Army as a whole. Data obtained for the combat sample (approximately 10,000 enlisted men from 6 Pentomic divisions) were compared with total Army statistics with respect to (1) aptitude area score distributions and (2) relative frequencies of aptitude area scores officially recorded as unsatisfactory. Study was further made, within combat divisions, of aptitude levels of men in different MOS, using the primary assignment MOS. Combat division personnel were found to average 2 points below total Army in scores on the various aptitude areas, including combat. They had 2 to 6 percent more men with scores below 90 in six of seven aptitude areas, again including the combat area. The combat aptitude of men in combat MOS averaged 6 points below combat aptitude of men in other than combat jobs. It was concluded that substantial benefit would be expected to the Army as a whole--not solely the combat arms--from implementation of an optimal allocation procedure using differential aptitude measures. (Author)

Adjutant General's Office, Washington, D. C.
DIFFERENTIAL VALIDITY OF THE ACB FOR COURSES IN SEVEN JOB AREAS, by William H. Helme. Rept. on New Classification Techniques c-00. Apr 60, 18p. 11 refs. Technical research rept. 1118.
Order from LC mi$2.40, ph$3.30 PB 149 457

Analysis was made of findings from studies in which the Army Classification Battery was validated against performance in 73 courses representing seven job areas. Four tests--Army Clerical Speed, Automotive Information, Electronics Information, and Army Radio Code Aptitude--were highly effective differential selectors for the related job areas. Three tests had high across-the-board validity, but each test has served a particular classification need as well--Verbal Test for Clerical MOS, Arithmetic Reasoning for Infantry MOS, and Pattern Analysis for Precision Maintenance MOS, Validity patterns of tests in the mechanical-electrical domain indicated need for addition of content to develop optimal differential predictors. (Author)

American Inst. for Research [Pittsburgh, Pa.]
ACCURACY OF INFORMATION ON LINE WORK ORDERS FOR ARMAMENT-ELECTRONICS MAINTENANCE, by Richard L. Krumm and Paul H. Newman. Rept. on Contract AF 41(657)119, Phase 2. Dec 58, 40p. WADC TR-58-490; AD-207 335.
Order from OTS $1.00 PB 151 705

Ten weeks were spent at two Armament-Electronics squadrons observing representative troubleshooting tasks. Observations were made of time spent by mechanics in performing 76 typical steps of a troubleshooting job. The observer then obtained from Line Work Orders the mechanics' statements of time required. Comparison of actual time worked with reported time indicated that (a) although the relationship between observed and reported time was curvilinear, there is reason to expect that the relationship would be linear if certain changes are made in squadron procedures; (b) errors in reporting time worked are largest for shorter jobs and for jobs requiring a time greater than four hours per man; (c) depending on the number of men available for assignment, squadrons may differ significantly in the number of man-hours spent on each job even though the jobs are of comparable difficulty; and (d) there is a marked consistency in the amount of time spent in accomplishing subtasks

of a troubleshooting job which are necessary, but which are not "troubleshooting" per se. (Author)

Behavioral Sciences Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
CONFERENCE ON INTEGRATED AIRCREW TRAINING (MARCH 1960), by Paul D. Hood, Richard L. Krumm and others. Rept. on Human Factors in the Design of Devices for Operator Training and Evaluation. July 60, 63p. 8 refs. WADD Technical rept. 60-320.
Order from OTS $1.75 PB 161 923

A conference was held to review information and stimulate discussion on the use of interconnected crew station simulators for aircrew training. The four presentations reveiwed recent research on this topic and specific problems associated with the further research and use of integrated aircrew training. The early history and theory of integrated crew training, as well as recent research into this area were presented. Equipment problems associated with B-52 integrated training were presented from the operational viewpoint; and the role of integrated aircrew training in a flight training program was discussed. (Author)

Bureau of Naval Personnel, Washington, D. C.
ABSTRACTS OF PERSONNEL RESEARCH REPORTS OF THE BUREAU OF NAVAL PERSONNEL.
June 60, Supersedes Mar 58, 109p. 163 refs. BuPers Technical Bulletin 60-6.
Order from LC mi$5.70, ph$16.80 PB 149 350

deFlorez Co., Inc., Englewood Cliffs, N. J.
THE APPLICATION OF POINT SOURCE PROJECTION TECHNIQUES TO AIR-TO-SURFACE TRAINING, by Edwin K. Smith, Frank J. Anastasio and others. Rept. on Contract Nonr-1628(00). June 59, 62p. 9 refs. Technical rept. NAVTRADEVCEN 1628-7; AD-235 074.
Order from LC mi$3.90, ph$10.80 PB 150 309

This report released for sale to the public 19 Sep 60.

The results are presented of an investigation to determine if a satisfactory visual presentation can be obtained with point light source techniques for application to an air-to-surface attack trainer. It includes an analysis of the training task to determine the skills to be developed and the cues required for its performance. The study has developed point source projection systems which will provide some training in air-to-surface attack. However, before proceeding with design and construction of a training device, certain limitations to the scope of the possible training exercises derived from limitations of the point source system should be reviewed and evaluated by persons fully conversant with the requirements of the training task. In addition, the concepts and configurations involved should be evaluated by the experiments described. (Author)

deFlorez Co., Inc., Englewood Cliffs, N. J.
THE APPLICATION OF POINT SOURCE PROJECTION TECHNIQUES TO GROUND OPERATION TRAINING, by Edwin K. Smith, Frank J. Anastasio and others. Rept. on Contract Nonr-1628(00). June 59, 35p. 3 refs. Technical rept. NAVTRADEVCEN 1628-10; AD-233 915.
Order from LC mi$3.00, ph$6.30 PB 150 312

This report released for sale to the public 19 Sep 60.

This report describes the results of a study to determine if a satisfactory visual presentation can be obtained with point light source techniques for application to a multi-vehicle ground reconnaissance operational trainer. The scope and important elements of the problem were determined from analysis of the training task as called out in the contract specification. The investigation revealed that a point light source projection system cannot be devised to meet the requirements of this task as specified. However, during the investigation it developed that the point source system might well be applicable to ground-level training tasks where the trainee follows predetermined general routes, such as roads and where terrain contour is not essential. In view of this development, it is recommended that point source visual displays be investigated further for application to training tasks with these characteristics; e.g., driver training devices. (Author) (See also PB 150 311)

deFlorez Co., Inc., Englewood Cliffs, N. J.
THE APPLICATION OF POINT SOURCE PROJECTION TECHNIQUES TO SURFACE VESSEL OPERATION TRAINING, by Edwin K. Smith, Frank J. Anastasio and others. Rept. on Contract Nonr-1628(00). June 59, 54p. 4 refs. Technical rept. NAVTRADEVCEN 1628-9; AD-233 914.
Order from LC mi$3.60, ph$9.30 PB 150 311

This report released for sale to the public 19 Sep 60.

An investigation was undertaken to determine if a satisfactory visual presentation can be obtained with point light source techniques for application to a destroyer docking trainer. It includes an analysis of the training task to determine the skills to be developed and the cues required for its performance. The study has developed point source projection systems which will provide valuable training in shiphandling and destroyer docking. However, the scope of training will be limited to some extent by limitations inherent in point light source systems. These should be fully investigated and evaluated by experiments described. (Author) (See also PB 150 310)

deFlorez Co., Inc., Englewood Cliffs, N. J.
THE APPLICATION OF POINT SOURCE PROJECTION TO AIR-TO-SURFACE OBSERVATION TRAINING, by Edwin K. Smith, Frank J. Anastasio and others. Rept. on Contract Nonr-1628(00). June 59, 45p. 9 refs. Technical rept. NAVTRADEVCEN 1628-8; AD-233 913.
Order from LC mi$3.30, ph$7.80 PB 150 310

This report released for sale to the public 19 Sep 60.

An effort was made to determine if a satisfactory visual presentation can be obtained with point light source techniques for application to an air-to-surface observation trainer. It includes an analysis of the training task to determine the skills to be developed and the cues required for its performance. A very promising point source projection system has been devised for use in air-to-surface observation training. It is recommended that his system be evaluated through the experiments described. (Author) (See also PB 150 309)

Human Resources Research Office, George Washington U., Washington, D. C.
BASIC ELECTRONICS FOR MINIMALLY QUALIFIED MEN: AN EXPERIMENTAL EVALUATION OF A METHOD OF PRESENTATION, by S. James Goffard, Norman W. Heimstra and others. Rept. on Limit I, Contract DA 49-106-qm-1. Feb 60, 29p. 3 refs. HumRRO Technical rept. 61; AD-233 596.
Order from LC mi$2.70, ph$4.80 PB 149 460

Methods of training were designed to improve the achievement in technical course of men with minimal qualifications for technical training. The three-week Basic Electronics section of the Field Radio Repair course (MOS 296.1) was reorganized according to the principle of "functional context." No item of information or training was presented until it could be fitted into a context of material already learned; training was in whole-to-part rather than in the conventional part-to-whole order. One group of standard input classes (a total of 184 men) was trained by the functional context method and another group (a total of 202 men) was trained by the conventional method. A battery of 10 tests on basic electronics was administered after the three weeks of training. The functional context training proved to be superior, particularly for men at the lower levels of aptitude for electronics training. (Author)

Human Resources Research Office, George Washington U., Washington, D. C.
DETERMINING TRAINING REQUIREMENTS FOR ELECTRIC SYSTEM MAINTENANCE: DEVELOPMENT AND TEST OF A NEW METHOD OF SKILL AND KNOWLEDGE ANALYSIS, by Edgar L. Shriver. Rept. on Contract DA 49-106-qm-1. June 60, 108p. 5 refs. Technical rept. 63.
Order from LC mi$5.70, ph$16.80 PB 149 202

The object of this study was to develop methods of analysis that would (1) accurately define the skills and knowledges needed for the operation and repair of electronic systems, and (2) be applicable to such systems in preproduction stages so that they could be used in forecasting training needs. Methods of analyzing the operation and maintenance (through fourth echelon) from the system itself were developed for the M33 radar system, and a cue-response training content was derived. A nine-day performance test (including about the same number and type of field malfunction problems that an average MOS 232.1 repairman would encounter during his first 8 to 12 months on the job) was used to evaluate the proficiency of about 40 students trained by the experimental and the standard courses. Although the experimental training required less than half as much time as the standard course, there was no practical difference in the proficiency of the two groups. (Author)

Human Resources Research Office, George Washington U., Washington, D. C.
EXPERIMENTAL COMPARISON OF TWO BASIC ELECTRONICS COURSES FOR FIRE CONTROL TECHNICIANS, by Lloyd Hitchcock, Jr. Rept. on Maintrain I, Contract DA 49-106-qm-1. Feb 60, 25p. 5 refs. HumRRO Technical rept. 60; AD-233 597.
Order from LC mi$2.70, ph$4.80 PB 149 459

Data is provided on the effectiveness of an experimental subcourse in basic electronics developed in earlier research as part of a training program for air defense electronics technicians. One class of trainees was given the standard 12-week subcourse in basic electronics and another received the shorter experimental course; both groups completed the standard program of instruction for maintenance of M33 equipment. Results of performance and written tests revealed no significant differences of proficiency between graduates of the two courses. The shorter basic electronics subcourse is recommended for adoption as standard preliminary instruction in electronic fire control maintenance courses and for possible application to maintenance training programs for other electronic equipment. (Author)

Naval Personnel Research Field Activity, San Diego, Calif.
DEVELOPMENT OF A DEVICE FOR SELECTING RECRUITERS, by Leonard Wollack and David Kipnis. Mar 60, 23p. 6 refs. BuPers Technical Bulletin 60-1.
Order from LC mi$2.70, ph$4.80 PB 149 318

Scores on the Persuasive Scale of the Kuder Preference Record were found to be statistically associated with success as a Navy recruiter, although the absolute magnitude of correlation was relatively small. Operational utility of the test would depend upon the numbers of applicants available who meet current eligibility requirements. (Author)

Naval Personnel Research Field Activity, Washington, D. C.
DEVELOPMENT OF PROBABILITY TABLES FOR PREDICTING GRADUATION FROM RADIOMAN CLASS "A" SCHOOL, by Bert T. King and Estella H. Gregory. Nov 59, 21p. 2 refs. BuPers Technical Bulletin 59-34.
Order from LC mi$2.70, ph$4.80 PB 149 349

In each week of the 24-week course given at Class "A" Radioman (RM) School, Bainbridge, large and significant differences in speed of reception of Morse Code messages were found between trainees who were eventually graduated and those who were dropped at some intermediate point. Probability tables were constructed which present, for each week and each code score, the chances in 100 that a given trainee would fail to graduate. Analysis indicated that such a predictions were reliable. Cumulative percentage curves were also presented which show the proportion of cases in the groups of Graduates and Drops

who earned code scores at or below a given point. These curves indicated that in any week of the course code scores could be used to screen out trainees who would be dropped in some later week.

Naval Personnel Research Field Activity, Washington, D. C.
SCHOOL GRADES AS CRITERIA FOR VALIDATION OF ENLISTED SELECTION TESTS, by John J. La Gaipa and David Kipnis. Dec 59, 23p. 9 refs. Technical Bulletin 59-31; AD-235 301.
Order from LC mi$2.70, ph$4.80 PB 147 791

Research was conducted on the criteria and predictors at Class A Schools in order to improve selection and classification processes. Analyses were made of Navy Basic Test Battery scores and school grades at the Yeoman Class A School, Bainbridge, for the year 1957. Ability to type and fleet experience were factors associated with higher school grades. It is suggested that typing ability testing be continued in the selection of applicants for the Yeoman School. Separate validity analyses of Fleet and Recruit input data confirm the use of separate standards for the two groups. (Author)

New York U., N. Y.
A STUDY OF THE LEARNING OF SELECTED DRIVING SKILLS THROUGH EXPOSURE TO A SPECIALLY PRODUCED MOTION PICTURE FILM, by Leon Brody. Rept. on Contract N61339-78. Apr 60, 20p. 3 refs. Technical rept. NAVTRADEVCEN 78-2.
Order from LC mi$2.40, ph$3.30 PB 148 798

The purpose of this study was to determine to what degree a relatively complete and complex skill might be learned by the sole use of an instructional film. Four driving skills were selected for investigation. Subjects were 51 male high school students, divided into an experimental and a control group. Both groups showed a significant and substantial increase in knowledge, after instruction, as measured by the Written Achievement Test. The group subjected to live instruction demonstrated statistically significant superiority over the film-instructed group on the road-performance tests held immediately after the experimental sessions, and again, one month later. In a practical sense, these absolute differences were quite small. No significant differences between the groups were found on the Written Achievement Test. Learning achieved by instruction was retained by both groups without significant loss as measured by the road performance re-test.

New York U., N. Y.
THE USE OF CONTEXT CUES IN TEACHING MACHINES, by Robert E. Silverman. Rept. on Contract N61339-507. 17 Mar 60, 32p. 14 refs. Technical rept. NAVTRADEVCEN 507-1.
Order from LC mi$3.00, ph$6.30 PB 148 755

Three experiments were conducted to investigate context cues in teaching machines. Experiment I with 120 subjects tested whether ancillary, background cues of colors and designs facilitated learning of paired-associates. It was found that these background cues interfered with learning. Experiment II, performed on 60 students, determined if isolating some items by making them vivid facilitated learning, and if such influence is enhanced when a given vivid context is consistently associated with a given work. Data showed that isolated vivid words are learned faster and that the entire list is also learned faster. Experiment II was comparable to Experiment I, only very difficult words were learned. The results showed no facilitations of learning. (Author)

Ohio State U. Research Foundation, Columbus.
BEHAVIOR TRAIT RATINGS BY PEERS AND REFERENCES, by Robert J. Wherry, Norman E. Stander, and John J. Hopkins. Technical rept. on Contract AF 41(657)222. Dec 59, 55p. 7 refs. WADC-TR-59-360.
Order from LC mi$3.60, ph$9.30 PB 149 293

Experience has shown that reliable trait ratings by peers can be secured during officer training that have appreciable validity for later ratings of officer effectiveness. This investigation tests the hypothesis that equally reliable and valid ratings can be secured from individuals listed as references by applicants for officer training. Four rating forms were developed, each using the same descriptive adjectives selected by factorial analysis of peer nominations. From the results of tryouts with college students, a check-list form and a modified forced-choice form were selected for mailing to references listed by the criterion sample of male under-graduate college students. Results from a 71-per-cent return of reference ratings showed that: (a) reliability, assuming an equal number of raters, was consistently lower than for peer ratings; (b) correlation with the criterion of peer nominations was markedly lower than for peer ratings, but was reasonably high for one class of raters (educators); (c) the check-list rating form brought a higher proportion of returns and yielded a higher validity than the modified forced-choice form. (Author)

Personnel Lab., Wright Air Development Div., Lackland AFB, Tex.
A FACTOR-ANALYTIC STUDY OF THE USAF OFFICER ACTIVITY INVENTORY, by Lonnie D. Valentine, Jr. Mar 60, 25p. 13 refs. WADD-TN-60-40.
Order from LC mi$2.70, ph$4.80 PB 149 292

This analysis was designed to determine the actual number of distinct fields of interest that can be identified by an interest inventory scaled for 16 officer career fields. Two factor-analytic techniques were applied to the 16 job-interest scores from the USAF Officer Activity Inventory for a sample of new officers. The analyses each yielded five significant factors (Combat and Operations Interest, Administrative Interest, Technical Interest, Quantitative Interest, and Administrative (Personnel) Interest) with corresponding factors defined by almost identical clusters of interest scales. In each analysis, one of the factors, Administrative (Personnel), was a subset of scales included in the broader Administrative factor. Thus, four distinct interest areas were defined, whose definition established their equivalence to the four interest measures included in the Air Force Officer Qualifying Test, and confirmed the judgment that four interest scales were adequate in the officer test battery. The factor analyses, presented in detail in the appendixes, are of special interest in showing how an incomplete hierarchical

structure can be handled by the Schmid-Leiman hierarchical factor model. (Author)

Richardson, Bellows, Henry and Co., Inc., New York
THE ACCEPTABILITY AND EFFECTIVENESS OF THE CASUAL USE OF AUDITORY TRAINING AIDS, by Harold Edgerton. Rept. on Contract N61339-373. Mar 60, 76p. 21 refs. Technical rept. NAVTRADEVCEN 373-1.
Order from LC mi$4.50, ph$12.30 PB 148 797

This study investigated the acceptability and effectiveness of recorded lesson reviews as supplementary aids to instruction in naval schools. Trainees from two schools, AN(P) and AE(A), at the Naval Air Technical Training Center, Jacksonville, Florida, participated in the study. In the AN(P) program, the total running time required for a single presentation of all the lesson reviews was 628 minutes. Each trainee listened, on the average, a total of 226 minutes, or 36% of the time. In the AE(A) program, the total running time was 198 minutes, with each trainee listening, on the average, a total of 120 minutes, or 61% of the time. Little relationship was found between the amount trainees listened to the lesson reviews and their intellectual ability. The groups who had the lesson reviews available did no better in course examinations than comparable groups who did not have the reviews available. Further, the trainees who listened most to the lesson reviews did no better in course examinations than those who listened least.

St. Louis U., Mo.
SOCIOMETRIC STATUS AND ATTITUDE CHARACTERISTICS OF SUCCESSFUL AND UNSUCCESSFUL WAVE RECRUITS, by Marilyn K. Rigby, Elizabeth D. Ossorio, and Walter L. Wilkins. Technical rept. no. 11 on Contract [Nonr-1304(04)] Sep 59, 42p. 6 refs.
Order from LC mi$3.30, ph$7.80 PB 148 886

Two instruments intended to discriminate successful from unsuccessful Wave recruits and to describe the Wave recruit group were administered to nine successive companies. A sociometric questionnaire discriminated successful from unsuccessful recruits in two independent samples. It is now in use at the Naval Training Center. An opinion survey was administered to four companies for the purposes of developing a key; when the papers from five additional companies of recruits were scored with the key, no significant discrimination between criterion groups was found. Neither were relationships found between scores derived from the opinion survey and sociometric standing. The opinion survey was subjected to both a linkage and a cluster analysis; descriptions of various recruit attributes were derived from the analyses of the resulting nine types and 13 clusters. Two clusters and two types from the linkage analysis also discriminated the criterion groups of the second sample. Among the discriminators were a cluster and a type both of which described women who are likely to complain at almost every opportunity. It was suggested that these women could be readily identified during an interview with a recruiter. (Author)

Air Force Command and Control Development Div., Bedford, Mass.
THE EFFECT OF STIMULUS VARIABILITY ON PREDICTION OF MAGNITUDE, by Anne W. Story. June 60, 20p. 9 refs. AFCCDD-TN-60-20.
Order from LC mi$2.70, ph$4.80 PB 149 212

According to probability matching experiments Ss' asymptotic probability of predicting an event equals the frequency with which that event has occurred. Such events have been invariant. An alternative, however, frequently varies over time. Apparently the more variable the alternative, the less will be its predicted magnitude. (Author)

Air Force Missile Development Center, Holloman AFB, N. Mex.
A CONTINUOUS TRACKING DEVICE FOR PRIMATES, by Frederick H. Rohles, Jr. and Marvin E. Grunzke. Apr 60, 14p. 2 refs. AFMDC-TR-60-10.
Order from LC mi$2.40, ph$3.30 PB 149 175

A tracking task was designed that requires a primate to track a continuously moving target in order to avoid electric shock. The device itself and the training procedures employed are described. (Author)

Applied Mathematics and Statistics Lab., Stanford U. Calif.
FOUNDATIONS OF STATISTICAL LEARNING THEORY. II. THE STIMULUS SAMPLING MODEL, by W. K. Estes and Patrick Suppes. Technical rept. no. 26 on Contract Nonr-225(17). 22 Oct 59, 143p. 8 refs. AD-229 275.
Order from LC mi$7.20, ph$22.80 PB 149 509

Principal axioms and general theorems of stimulus sampling theory are given. A few results for particular experimental cases are given for illustrative purposes, but the systematic working out of special cases, especially those involving various types of reinforcement and discrimination schedules, is deferred for later presentation. (Author) (See also PB 137 998)

Army Medical Research Lab., Fort Knox, Ky.
AN OBSERVER CONSTANT IN THE PERCEPTION OF STEREOSCOPIC DEPTH, by W. C. Gogel. 3 Feb 58, 27p. 4 refs. Rept. no. 316; AD-160 344.
Order from LC mi$2.70, ph$4.80 PB 146 315

Two experiments were conducted to determine whether the amount of binocular disparity necessary to perceptually duplicate a frontal extent in depth is proportional to the angular size of the frontal extent, is independent of convergence distance and is particular for a subject. The following results were obtained: The magnitude of the adjusted binocular disparity required for the depth duplication (1) increased with the increase in the magnitude of the horizontal extent being duplicated, (2) showed no statistically significant change with a 2^{o} change in convergence, (3) was relia-

bly different between subjects. The results suggest that an observer constant occurs which specifies the amount of binocular disparity perceptually equivalent to an angular unit of frontal extent. (Author)

California U., Los Angeles.
THE OBSERVING RESPONSE IN DISCRIMINATION LEARNING, by Richard C. Atkinson. Technical rept. 4 on Contract Nonr-233(58). 1 Sep 59, 25p. 9 refs. AD-225 664.
Order from LC mi$2.70, ph$4.80 PB 148 888

Observing responses in discrimination learning are analyzed. The experimental situation consists of a sequence of discrete trials as follows: [1] ready signal to which S (subject) makes either an O_1 or O_2 (observing) response; [2] following the observing response, one of three cues, s_1, s_2, or s_c (stimulus events) is presented; [3] to the onset of s_i, S makes an A_1 or A_2 (discrimination) response; and [4] either E_1 or E_2 (reinforcing events) occurs and terminates the trail. E_1 indicates that A_1 was the correct response on that trial. The model provided a fairly adequate account for such measures as (1) the asymptotic probability of an O_1 response; (2) the asymptotic probability of an A_1 response on an S_i trial and (3) the asymptotic probability of the joint event of an O_k response and an A_1 response. An analysis of certain sequential effects indicates marked differences between theory and observation. The observed proportions of observing responses conditionalized on correct and incorrect A_1 responses were markedly different from theoretical predictions.

Educational Testing Service, Princeton, N. J.
DIMENSIONS OF SOCIAL DESIRABILITY, by Samuel Messick. Rept. on Contract Nonr-2214(00). Apr 59, 28p. 22 refs.
Order from LC mi$2.70, ph$4.80 PB 147 806

Attempted controls in personality inventories for the tendency to respond in a socially desirable way usually assume that the domain of desirability is unidimensional. The present study attempted to evaluate this assumption and to explore the nature of any multidimensional structure uncovered. Ratings of the desirability of personality items from the Edwards Personal Preference Schedule were intercorrelated and factor analyzed. Nine factors were extracted and rotated to oblique simple structure. The factors were labeled and interpreted in terms of different "points of view" as to what is desirable. The finding of several dimensions of desirability suggests that the equating of items in terms of a single average desirability scale would leave much of the consistent variance of the ratings uncontrolled. Such a control method would provide inconsistent effectiveness for individual assessment, depending upon the subject's conformity to the group consensus of desirability. (Author)

Fels Group Dynamic Center, U. of Delaware, Newark.
THE MINORITY NEWCOMER IN OPEN AND CLOSED GROUPS, by Robert C. Ziller, Richard D. Behringer and Jacqueline D. Goodchilds. Technical rept. no. 1 on Perception Variables and Communication Efficiency, Contract Nonr-2285(02). 19 Oct 59, 18p. 8 refs. AD-228 089.
Order from LC mi$2.40, ph$3.30 PB 149 473

This laboratory experiment was concerned with the assimilation of the newcomer under conditions where the host group expected membership changes (an open group) or did not expect membership changes (a closed group) and the perceived relative status of the donor group or culture (represented by a Negro or White newcomer). While the results with reference to the initial hypotheses were not statistically significant there was some evidence that under the closed-Negro conditions the newcomer was the least well assimilated. However, it was noted that the Negro newcomer and confederate tended to be rated significantly higher than the White counterparts. Moreover, the "halo effect" between ratings tended to be more pronounced with reference to the Negro newcomer. Finally, the relationship between attitude toward the confederate and actual change of opinion on a given task was more pronounced under the Negro conditions. It was concluded that interpersonal orientation is a more critical consideration in interracial groups or in groups where there are distinct differentiating characteristics among the various subgroups. The higher ratings of the Negro confederates were attributed to "overcorrection for possible prejudice." (Author)

Michigan U., Ann Arbor.
ATTITUDE CHANGE AND ATTITUDE STRUCTURE, by Helen Peak. Final rept. on Contract Nonr-1224(10). Oct 59, 35p. 25 refs. AD-230 479.
Order from LC mi$3.00, ph$6.30 PB 149 519

Contents:
Attitude change and psychological structure
- Effects of aroused motives on attitudes
- Some personality and information correlates of change
- Generalization within opposites structures
- Generalization within serial structures
- Correlates of opposites structures
- Opposites, defenses and attitudes

Determining the nature of structures
- Observation of existing structure
- Building structures

The problem of attitude changes
- Attitude change as a change in performance
- Structural change-learning and attitude change
- Structural targets of change
- Conditions of structural change

Generalization theory

Michigan U. [Ann Arbor]
ATTITUDES, OPPOSITES STRUCTURING AND F SCORES, by Helen Peak. Technical rept. no. 5 on Contract Nonr-1224(10). 1 May 59, 18p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 146 604

Evidence is presented in support of the hypothesis that people tend to be consistent in structuring different situations as opposites. There was little evidence that a tendency toward opposites structuring was related to direction of attitude toward the ingroup and the outgroup as has been suggested by some writers (Adorno, et al. 1950). There was a tendency for opposites measures to correlate with the extremeness of attitude rather than its direction as had been expected. F scores were not related to general opposites structuring. However, there was a significant positive relation between F and the attitude difference score (in-

group minus outgroup attitude scores.) The prediction that a combination of high F and high opposites would yield the most favorable ingroup attitudes and the least favorable outgroup attitudes was not borne out. The theory of displacement of hostility from the ingroup to the outgroup implies that there should be a negative correlation between ingroup and outgroup attitudes in those situations where displacement might be expected to occur; namely among Ss with high F scores. The only sign of a negative correlation (and this was not significant) occurred in the high F-low opposite groups. There was no support for the displacement hypothesis but it is suggested that it needs testing in a sample with a wider range of attitudes.

Michigan U. [Ann Arbor].
CORRELATES OF OPPOSITES STRUCTURES, by Helen Peak. Technical rept. no. 7 on Contract Nonr-1224(10). 1 June 59, 52p. 18 refs.
Order from LC mi$3.60, ph$9.30 PB 147 260

The Report describes a pretest and a major study, Opposites IIIb, which has attempted to predict attitudes toward the ingroup and outgroup from a combination of information about opposites structure and defense preferences.

Michigan U., Ann Arbor.
THE EFFECTS OF AROUSED MOTIVATION ON ATTITUDES, by Helen Peak. Technical rept. no. 8 on Contract Nonr-1224(10). 1 Sep 59, 18. 5 refs. AD-230 477.
Order from LC mi$2.40, ph$3.30 PB 148 864

Two hypotheses were investigated: (1) attitudes toward situations or objects will be a function of subjects' perception of the good or bad consequences of the situation; and (2) attitudes are a function of the degree of arousal (intensity) of those consequences. Hypothesis I was supported clearly. The analysis of hypothesis II based on achievement scores and change in achievement scores showed no significant relations of any kind. Another test of the hypothesis was possible through observing the significance of change in attitude from neutral to arousal conditions in those who regarded a given policy as instrumental when compared to those who did not see any relevance of a policy to making good grades. When tested by this method Hypothesis II was supported.

Ohio State U. Research Foundation, Columbus.
A STUDY OF SELECTED FACTORS AFFECTING THE MEASUREMENT OF TOTAL TEAM PRODUCT IN GUNFIRE SUPPORT TRAINING, by John E. Horrocks, Emil Heermann, and Michael Kalk. Rept. on Contract Nonr-1939(00). 25 Nov 59, 19p. 2 refs. Technical rept. NAVTRADEVCEN 1939-0-4.
Order from LC mi$2.40, ph$3.30 PB 146 994

A summed error score in which cancelling-out effects of errors were eliminated did not provide a more consistent predictable measure of team performance than did the resultant error score in which cancelling-out errors were present. A technique for the measurement of team performance is recommended.

Research Center for Mental Health, New York U., N. Y.
RESEARCH ON THE EFFECTS OF ISOLATION ON COGNITIVE FUNCTIONING, by Robert R. Holt and Leo Goldberger. Rept. for 15 Oct 58-14 Oct 59 on Biophysics of Flight, Contract AF 33(616)6103. Mar 60, 26p. 5 refs. WADD Technical rept. 60-260.
Order from OTS $0.75 PB 161 922

The study was undertaken to compare the effects of 100 gamma of LSD-25 with those of 8 hours of perceptual isolation, carried out in the McGill style. Fifteen civilian subjects (actors) showed impairment on only 1 of 9 cognitive tests after the 8-hour isolation. The same test (Robinson's Rhymes) was not quite significantly impaired by LSD, but the time score for Serial Sevens was significantly impaired. On a questionnaire designed to elicit reports of the main symptoms of the drug, there was almost no overlap between the post-isolation and post-LSD scores, the latter being very much higher. The qualitative patterns of symptoms were quite different also. LSD produces a state subjectively more striking and qualitatively different from the effects of 8 hours of isolation. A battery of cognitive tests did not prove differentially sensitive to the reported deleterious effects of both conditions on mental functions. (Author)

Rochester U., N. Y.
THE EXPERIMENTAL ANALYSIS OF MOOD [and] A FACTOR ANALYTIC STUDY OF THE DOMAIN OF MOOD WITH INDEPENDENT VALIDATION OF THE FACTORS, by Vincent Nowlis and Russel F. Green. Technical repts. no. 3 and 4 on Research Program on Mood and Attitude Change, Contract Nonr-668(12). 21 Sep 57, 26p. 19 refs. AD-231 243.
Order from LC mi$2.70, ph$4.80 PB 148 900

A discussion is presented of (1) the development of hypotheses about mood and about the main dimensions of the verbal report of mood; (2) the development of an instrument of eliciting verbal report of mood in quantifiable form; (3) repeated factor analyses of the verbal reports to develop the most useful hypothetical factors; (4) search for lawful changes in mood in response to controlled changes in important environmental factors; and (5) search for relations between induced changes in mood and other behavioral factors.

Rochester U., N. Y.
LEVEL OF HOSTILITY AND ATTITUDE CHANGE, by Sheldon Alexander (U. of Illinois). Doctoral thesis. Technical rept. no. 2 on Research Program on Mood and Attitude Change, Contract Nonr-668(12). 21 Sep 59, 12p. 13 refs. AD-231 244.
Order from LC mi$2.40, ph$3.30 PB 148 899

An experiment was conducted to examine the effect of personality hostility on attitude change and the interaction between externally-induced hostility and personality hostility. Four messages were given to 357 male high school students. These included: (1) a high hostility arousal message; (2) a moderate hostility arousal message; (3) a low hostility arousal message; and (4) a control message, on another topic, designed to produce no emotion arousal. Results were interpreted as providing no support for the hypothesis of an inverse and as providing some support for the hypothesis of a direct relation.

Rochester U., N. Y.
THE RELATIONSHIP OF MOOD AND MOOD SHIFT TO ATTITUDE, by Joel Axelrod (Dancer-Fitzgerald-Sample, Inc.). Technical rept. no. 5 on Research Program on Mood and Attitude Change, Contract Nonr-668(12). 21 Sep 59, 15p. 7 refs. AD-231 245.
Order from LC mi$2.40, ph$3.30 PB 148 901

An experiment was designed (1) to determine the validity of using moods as goals in predicting attitude structure; and (2) to determine if shifts in mood can be systematically related to shifts in attitude. The results generally tend to support the use of moods as goals, and to indicate a systematic relationship between mood shift and attitude shift. (Author) (See also PB 148 900)

Texas A. & M. Research Foundation, College Station.
ADAPTIVE BEHAVIOR AND ADAPTATION LEVEL THEORY, by Warren C. Bonney and Clay E. George (Arizona State U.). Technical rept. no. 3 on Contract Nonr-2119(01). Sep 59, 22p. 6 refs. AD-226 432.
Order from LC mi$2.70, ph$4.80 PB 148 858

An experiment was designed to determine the relationship involved in affective adaptation, and a second experiment was designed to measure the relationship between affective adaptation and improvement in reading during a course in remedial reading, both being measured by the pictorial preference series. In addition, an investigation of group adaptation trends was made which included analysis of data, based on responses to form-color stimuli presented in a variety of serial orders and collected from several widely differing groups. Results indicated that nonauthoritarian subjects of low peer status are much less readily bored than are the subjects in the other categories. The results further indicated that the most adaptable subjects were those characterized by at least 2 of the following attributes: (1) high in peer acceptance; (2) above the reference group median on the SCAT; and (3) below the reference group medium on the F-scale. Data from achromatic, appropriate, and inappropriate slides indicated that throughout the slide series, the high peer group with low F scores tended to have an increasing dislike for outline and appropriate slides, and an increasing like for inappropriate slides, while the low peer status group with low F scores tended to like the outline and appropriate slides and tended to increasingly dislike the inappropriate slides.

BIOLOGICAL SCIENCES

Brooke Army Medical Center, Fort Sam Houston, Tex.
RADIATION AND THERMAL BURNS, by R. S. Goldsmith, B. W. Evans and others. Annual research progress rept. on Proj. 6X59-06-001. 30 June 60, 182p. 57 refs.
Order from LC mi$8.40, ph$28.80 PB 149 149

The projects reported are: serotonin metabolism in burned patients and experimental animals; a study of serum haptoglobin levels in man following thermal injury; environmental factors in burns; ventilation studies in the burned patient; riboflavin metabolism in burned rats; effect of varying the calorie; nitrogen ratio on predetermined levels of nitrogen required by the burned patient; wound management and nitrogen metabolism in burned rats; role of the eschar on post-burn weight of rats; studies of urinary tract infections in burned patients; limited use of antibiotics in the seriously burned patient; in vitro evaluation of new antibiotics concerned in treatment of burned patients; the hemagglutination inhibition test for serologic diagnosis of pseudomonas endotxemia in the burned patient measurement of pseudomonas antibody in normal and burned patients by a mouse protection test; serodiagnosis and bacteriophage typing of pseudomonads; serologic demonstration of existence of a "burn toxin" in the serum of newly burned individuals and the antibody of this toxin in convalescent burned patients; determination of properdin levels in the serum of burned individuals as a measurement of host response in eventuating bacteremia; bacteriophage typing of staphylococcus aureus; clinical operation, burn center; the effect of massive occlusive dressings on normal adult male; early excision and grafting of extensive areas of full-thickness burns; clinical-pathological study of fatal burn injuries.

Brooke Army Medical Center, Fort Sam Houston, Tex.
TRAUMATIC SURGERY AND SHOCK, by Paul E. Teschan, Thomas F. O'Brien and others. Annual research progress rept. for 1 July 59-30 June 60, on Proj. 6X59-01-001. 30 June 60, 183p. 56 refs.
Order from LC mi$8.40, ph$28.80 PB 149 148

The projects reported are: clinical operation, renal center; prophylactic hemodialysis in the treatment of acute renal failure; dialyzer testing; acute renal insufficiency in experimental animals; persistance of antibiotic activity in serum of anuric patients (less than 100 cc. of urine per 24 hours), after a single intramuscular does; humoral factors in kidney regeneration; behavioral factors in acute renal failure; surgical management of upper abdominal trauma (pancreatic injury); experimental investigation of intra-abdominal hemorrhage control - "canine survival following intraluminal occlusion of the aorta above the celiac artery"; energy metabolism in tissues.

Naval Ordnance Test Station, China Lake, Calif.
WATER FLOW ABOUT A SWIMMING FISH, by Moe William Rosen. Master's thesis. May 59, 100p. 9 refs. NOTS TP 2298.
Order from LC mi$5.40, ph$15.30 PB 148 351

A series of experiments were conducted with a very small fish in an attempt to determine the nature of the water flow about the swimming animal's variable form. The endeavors were failing until discovery was made of a very sensitive method which showed the entire field of water flow without inhibiting the action or the life processes of the fish. The experiments discovered a flow process and phenomena that are unfamiliar and surprising, involving discrete unit quanta of fluid energy. The observed flow is not in conformance with

presently accepted ideas of laminar or of turbulent flow about a fish. Easily distinguishable particles flowed about the fish. A flow pattern was observed about a dolphin as it leaped into the air, emerging at high speed from below the water surface. This experiment showed a remarkable flow similarity with the small fish experiments. The observed behavior of the water on the small fish's body exhibits correlation with the actions of a fish when taken out of the water. A method was developed, making possible the construction of the relative streamlines about the fish's undulating body. A simple mathematical equation was derived relating the speed of a fish or dolphin to its body motions. The equation was reasonably verified by the measurements made in the experiments.

Naval Research Lab., Washington, D. C.
A FORCE-AREA STUDY OF CATALASE FILMS, by J. D. Bultman and J. M. Leonard. Final rept. 27 July 60, 7p. 18 refs. NRL rept. 5490.
Order from LC mi$1.80, ph$1.80 PB 146 162

An investigation of the surface chemical behavior of the enzyme, beef liver catalase, was undertaken. Monomolecular layers were deposited on ammonium sulfate solutions, the surface concentration varying from 7.8×10^{13} to 16.4×10^{13} molecules per film. Force-area (F-A) curves obtained by compression of these films show two inflections corresponding to different orientations of the catalase molecule. Extrapolation of the linear portions of the curves to zero film pressure gave cross-sectional areas per molecule of $(25.6 \pm 1.0) \times 10^3$ Å^2 and $(7.9 \pm 1.6) \times 10^3$ Å^2, respectively, as calculated at these two inflections.

Quartermaster Research and Engineering Center, Natick, Mass.
A VEGETATION TRANSECT OF THE THULE PENINSULA, by Ronald A. Nelson. Apr 58, 16p. 16 refs. Research Study Rept. RER-18.
Order from LC mi$2.40, ph$3.30 PB 150 004

This report released for sale to the public 26 Aug 60

Vegetation of the Thule Peninsula was sampled along a 16-mile transect between Thule Air Base and Camp Tuto. The general vegetation is small and sparse. Grasses and sedges, found in marshy areas, are the largest plants; most of the trees and other plants are less than five inches high. The vegetation may be used in an emergency for fuel, food, and insulation by individuals or small groups; it is of no value for providing opportunities for cover or concealment. (Author)

Anatomy and Physiology

Air Force Missile Development Center, Holloman AFB, N. Mex.
NONOGRAPHS FOR MULTIPHASE ACCELERATION PROFILES, by Hubert C. Feder. June 60, 85p. 7 refs. AFMDC-TR-60-9.
Order from LC mi$4.80, ph$13.80 PB 149 176

Experimental investigations of the technological and physiological effects of unidirectional accelerations require the computation of the parameters of the acceleration pattern. This report develops explicit equations between distance, velocity, acceleration, and time, thus greatly reducing the computational work of test analysis and evaluation. Two nomographs were designed which permit reading distance with an error of less than 2 percent and velocity with error less than 0.2 percent. The three principal phases of the acceleration pattern are used to define a set of descriptive parameters. An impulse-dependent onset parameter, called relative onset rate, is discussed and, if used as a standard, would facilitate the comparison of tests made by different investigators. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE BLOOD CHEMISTRY OF THE CASTRATED MALE GOAT, by Paul F. Robinson. Apr 60, 8p. 16 refs. CWLR-2386; AD-236 946.
Order from LC mi$1.80, ph$1.80 PB 148 909

Biochemical analysis of the blood of forty-four castrated male angora goats, of uniform size and condition, yielded values that did not seem to differ markedly from those obtained by other authors in goats of a different physiological status. The mean value obtained for plasma sodium was 148.8 mEq/L; for plasma potassium 4.9 mEq/l; for total plasma cholesterol 44.8 mg/100 ml; for whole blood glucose 81.4 mg/100 ml; for plasma chloride 106.8 mEq/L; and for plasma protein 7.2 gm/100 ml. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE RESISTANCE OF RABBIT EYE TO STEEL SPHERES AND CUBES, by George M. Stewart. Jan 60, 16p. 6 refs. CWLR 2332; AD-231 038.
Order from LC mi$2.40, ph$3.30 PB 147 236

The resistance of the rabbit eye to penetration by steel spheres and cubes in the weight range of 0.85 grain through 225.0 grains was studied. Rabbits varying in age from 5 to 7 mo were killed and their eyes were removed and mounted in gelatin for ballistic evaluation. Cubes striking at velocities near the ballistic limit were frequently rejected even after penetrating the cornea. Under the same conditions of test, spheres were often retained. Partially penetrating missiles, except very small ones, were almost always rejected. (Author)

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
X-IRRADIATION AND ACCELERATION STRESS, by John W. Taylor. Rept. no. 1 on Task MR005.15-0002.14. 1 Mar 60, 9p. 3 refs. NADC MA-6003; AD-234 596.
Order from LC mi$1.80, ph$1.80 PB 146 962

It was determined whether a correlation existed between the stress due to ex-irradiation and the stress due to acceleration. Sprague-Dawley rats were exposed to an acute dose of 600 r ±20% x-irradiation

and then centrifuged at 20 G for 7 minutes. The data resulting from this procedure was then compared with data for two control groups, one centrifuged and one irradiated. There appeared to be no significant correlation between irradiation stress and acceleration stress at the experimental levels used in the study. (Author)

California U., Los Angeles.
AN ENGINEERING ANALYSIS OF CARGO HANDLING. X. ENERGY EXPENDITURE OF LONGSHOREMEN, by Frank C. Hale and John J. O'Hara. Rept. on Contract Nonr-233(07). June 59, 58p. 59 refs. Dept. of Engineering rept. no. 59-20; AD-230 108.
Order from LC mi$3.60, ph$9.30 PB 147 573

A study was carried out of longshoring in the maritime cargo transport industry in the Los Angeles - Long Beach harbors, combining the methods of physiological measurement of energy cost and industrial engineering methods of activity measurement. Energy cost was assessed by the indirect methods of oxygen consumption, heart rate and ventilatory responses. Activity measurements were made by systematic work sampling techniques. (See also PB 143 700)

California U., Berkeley School of Medicine.
POSSIBLE EFFECT OF REDUCTION IN BODY TEMPERATURES ON CELLULAR FUNCTION DURING HYPOTHERMIA, by S. F. Cook. Rept. for 1 Feb-30 Apr 59 on Contract AF 41(657)184. June 59, 8p. 3 refs. AAL-TN-59-12; AD-233 845.
Order from LC mi$1.80, ph$1.80 PB 146 625

An investigation to determine what effect, if any, a reduction in body temperature might have on cellular function. The data obtained forms the basis of the present report. Two tissues, liver and kidney, have been run. The results are given in tables.

Duke U. [Durham, N. C.]
THE PHYSIOLOGICAL RESPONSE TO PRESSURES GREATER THAN 1 ATMOSPHERE, by Kenneth E. Penrod. Final rept. for 1 July 51-30 June 59, on Contract Nonr-473(00). [1959] 6p. 3 refs.
Order from LC mi$1.80, ph$1.80 PB 146 693

[Hammersmith Hospital] London (Gt. Brit.)
FUNCTION OF THE HUMAN ADRENAL CORTEX, by C. L. Cope. Annual technical status rept. for 1 Feb 59-31 Jan 60 on Contract DA 91-591-EUC-1055. [1960] 15p. AD-234 400.
Order from LC mi$2.40, ph$3.30 PB 146 957

Effort was directed toward the development of analytical methods for aldosterone metabolism. The purity and stability of the tritiated aldosterone was determined. The behavior of aldosterone on a variety of chromatographic systems was measured. A major metabolite of aldosterone was recovered from urine samples; measurements were made of its running rate on a variety of chromatographic systems, its concentration in urine, and also its stability. The reagent ^{14}C-acetic anhydride was used to estimate the quantities of both aldosterone and of aldosterone metabolite. Doses of tritium-labeled aldosterone were administered intravenously to suitable subjects and the distribution of this tritium in various fractions of the excreted urine was measured. The aldosterone metabolite was extracted and its specific activity in various urine samples measured.

Quartermaster Research and Engineering Center, Natick, Mass.
THE COMPARATIVE EFFECTIVENESS OF SOME PSYCHOLOGICAL AND PHYSIOLOGICAL MEASURES IN RANKING THE IMPACT OF DIVERSE ENVIRONMENTAL CONDITIONS, by Edward J. Fine. Jan 58, 11p. 13 refs. Research Study Rept. PB-15.
Order from LC mi$2.40, ph$3.30 PB 150 000

This report released for sale to the public 13 Sep 60.

Two studies are presented, both of which compare the effectiveness of a subjective rating scale with two physiological measures, mean weighted skin temperature and average increase in metabolic rate, in ranking eight environmental conditions (varying in ambient temperature, humidity and wind speed) from warmest to coldest. The results of both studies indicate a high degree of consistency between individual responses on each measure and a very high degree of agreement between the subjective rating method and both mean weighted skin temperature and metabolic rate methods of ranking the conditions. (Author)

Quartermaster Research and Engineering Center, Natick, Mass.
MEASUREMENT OF RELATIVE BODY SURFACE TEMPERATURE VARIATION AND A CONCEPT OF SKIN TEMPERATURE STRESS, by Warren H. Teichner. June 58, 10p. 3 refs. Research Study Rept. PB-22.
Order from LC mi$1.80, ph$1.80 PB 150 001

This report released for sale to the public 26 Aug 60.

The skin temperature of ten body points taken from nude men after 45 minutes of rest in an environment of 80°F., 50 percent R.H., still air was defined as a general standard against which it was proposed that all other similar measures be compared in studies of surface temperature variation, skin temperature stress, comfort, and performance. Two procedures for making such comparisons were proposed; one involved the use of a skin temperature profile based upon general standard and the other involved the use of the standard error of fit of experimental measure- to the general standard as a measure of amount of relative skin temperature variation or stress. Data were presented illustrating application of the concepts under a variety of experimental conditions. (Author)

Quartermaster Research and Engineering Center, Natick, Mass.
OXYGEN CONSUMPTION AND BODY TEMPERATURE DURING SLEEP IN COLD ENVIRONMENTS, by M. B. Kreider and P. F. Iampietro. Mar 60, 9p. 10 refs. Technical rept. EP-127; AD-236 834.
Order from LC mi$1.80, ph$1.80 PB 147 796

Six young soldiers slept at the following ambient temperatures: 25.5 to 26°C (78 to 80°F), 15 to 18.5°C (60 to 65°F) and -32 to -34.5°C (-25 to -30°F). Rectal (T_r) and skin temperatures were recorded and mean weighted skin temperature (T_s) was calculated at half-hour intervals every night; oxygen consumption (VO_2) was measured at 6-min intervals on occasional nights. During sleep at a comfortable temperature (25.5°C) T_r, T_s and VO_2 decreased below the resting levels measured just before retiring. During sleep in cold environments, T_r and T_s dropped to still lower levels, with the lowest values recorded at an earlier hour of the night. VO_2 during sleep in the cold did not differ from values recorded during sleep at 25.5°C. Lowest values measured during sleep in the coldest environment were 35.5°C, 30.5°C, and 78 Cal/m^2 for T_r, T_s and body heat debt, respectively. These values may represent the limits of body cooling compatible with substantially continuous sleep in the cold. (Author)

Texas U., Austin.
RELATIONSHIP BETWEEN ALTERNATE BINAURAL BIFREQUENCY LOUDNESS-BALANCE TEST AND THRESHOLD TONE-DECAY TEST RESPONSES IN NORMAL AND SUBNORMAL EARS, by Lennart L. Kopra, Roger W. Fullington, and Lee E. Strickland. Apr 60, 13p. 12 refs. AFSAM 60-19.
Order from LC mi$2.40, ph$3.30 PB 149 351

The alternate binaural bifrequency loudness-balance test (500 cps versus 4000 cps) and the threshold tone-decay test were administered to 20 male subjects with bilateral normal hearing and to 14 subjects with significant bilateral high-frequency sensori-neutral loss. Results showed that (a) when a span difference of 30 db was used as the criterion for abnormal loudness increase, 13 of the subnormal subjects demonstrated abnormal loudness at 4000 cps in both right and left ears, and one of the normal subjects showed abnormal loudness increase in one ear; (b) in the threshold tone-decay test the differences between median sensation levels required for 60-second awareness by normal and subnormal subjects were not significantly different at any test frequency from 250 cps through 6000 cps; and (c) no systematic interrelationships were observed between alternate binaural loudness balance test results and threshold tone-decay test results. (Author)

University Hospitals, Iowa City.
SHEARING MOTION IN SCALA MEDIA OF COCHLEAR MODELS, by Juergen Tonndorf. Apr 60, 11p. 14 refs. AFSAM rept. 60-41.
Order from LC mi$2.40, ph$3.30 PB 149 243

The occurrence of shearing motion within the cochlear duct, together with the fact that it is this mode of motion which constitutes the adequate stimulus for hair cells, was first reported by Bekesy in 1953. Two modes of shearing motion were reported: (1) radial, directed in the region proximal to the place of maximal amplitude of the traveling-wave pattern; and (2) longitudinal, directed distal to that point. This phenomenon was studied in cochlear models. The envelopes over both modes of shearing motion were found to be much smaller than that over the traveling-wave pattern. A simple explanation presented itself: The direction of the shearing motion in each domain coincides with the dominant curvature produced by the traveling waves in that section of the cochlear duct.

Yale U., New Haven, Conn.
DEVELOPMENT OF CRITERIA OF PHYSICAL PROFICIENCY, by Edwin A. Fleishman. Annual rept. for 15 Nov 58-15 Oct 59 on Contract SAR/Nonr-609(32). 15 Oct 59, 6p. AD-228 843.
Order from LC mi$1.80, ph$1.80 PB 149 479

This study is designed to develop improved measures for the assessment of physical proficiency. These measures may be useful in providing a more comprehensive evaluation of students in physical education programs. Other implications would be possible use in classification and selection programs, especially for jobs that require physical strength, coordination, and endurance.

General Biology

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
WAVE ANALYSIS OF TISSUE NOISE AND MUSCLE ACTION POTENTIAL, by Keith J. Hayes. 22 June 59, 16p. 5 refs. NM 17 01 13 1; NAMC-ACEL-404; AD-218 206.
Order from LC mi$2.40, ph$3.30 PB 146 703

The sensitivity attainable in bio-electric measurement may commonly be limited by tissue noise, rather than by amplifier noise. The spectrum level of tissue noise increases with decreasing frequency down to at least 2.5 c/s where it may exceed amplifier noise by 5 to 25 db. It is ordinarily weaker than amplifier noise at frequencies above 1000 c/s. The spectrum of muscle action potentials is characterized by a rather narrow maximum in the region of 30 to 100 c/s. Amplifiers for surface electromyography may advantageously be designed with a pass-band as narrow as one octave, for maximum signal-to-noise ratio. However, extending the upper frequency limit to 1000 c/s facilitates audio and oscilloscopic monitoring. (Author)

Pacific Science Board, National Research Council, Washington, D. C.
ATOLL RESEARCH BULLETIN NO. 71. MICROCLIMATIC OBSERVATIONS AT ENIWETOK (WITH A SPECIAL SECTION ON VEGETATION) by David I. Blumenstock, Daniel F. Rex, and Irwin E. Lane. Rept. on Eniwetok Microclimatic Project, Contract [Nonr]-2300(12). 30 June 59, 166p. 19 refs.
Order from LC mi$7.80, ph$25.80 PB 148 666

Quartermaster Research and Engineering Center, Natick, Mass.
THE USE OF SHORT WAVE ULTRA-VIOLET RAYS FOR THE SEGREGATION OF COMMINGLED SKELETAL REMAINS, by Thomas W. McKern. Aug 58, 13p. 5 refs. Technical rept. EP-98.
Order from LC mi$2.40, ph$3.30 PB 150 003

This report released for sale to the public 26 Aug 60.

When bone surfaces are exposed to short wave ultraviolet irradiation, most of them reflect a variety of

colors. The wide range of color emission, as well as the fixed relationship of these colors to the substances that emit them, is justification for attempting to apply these qualities to the segregation of commingled skeletal remains. After demonstrations of the results of ultra-violet exposure on a large sample of skeletal material, it is suggested that short wave ultra-violet lamps can be used in certain instances for the accurate sorting of commingled remains. (Author) (Color photographs will not reproduce)

Medical Specialties and Equipment

Avco Corp., Wilmington, Mass.
RESEARCH IN THE INVESTIGATION OF THE FEASIBILITY OF AN OPTICAL DENTAL DRILLING DEVICE. Final rept. on Contract Nonr-2681(00). [1959] 18p. RAD-SR-59-50; AD-227 144.
Order from LC mi$2.40, ph$3.30 PB 148 887

The feasibility of developing an electro-optic monitoring system for observation of the oral cavity was investigated. Such a system would incorporate a closed circuit television arrangement so that dental procedures could be simultaneously presented to others. Two concepts were taken under investigation for attainment of the goal. The first pertained to an examination of miniaturized vidicon tubes which might be incorporated directly on or into the handpiece or contra-angle. This approach was abandoned after demonstrating that miniaturized vidicon tube development had not progressed sufficiently, whereby direct application could be obtained. One approach introduced the concept of fiber bundles linked with a closed circuit television system. These bundles are made up of a multitude of individual flexible fibers which transmit light as a result of multiple total internal reflections from one end to the other. Attachment of the distal end of the bundle to the handpiece or contra-angle, or held separately, and the proximal end linked to a television camera, provided the methodology whereby selected portions of the oral cavity could be portrayed on a standard television monitor. Experimental studies utilizing this method are presented and the feasibility of developing an operational device demonstrated. Recommendations pertaining to a suitable development program providing for the synthesis of an operational device are incorporated. (Author)

Medical Coll. of Virginia, Richmond.
A BIBLIOGRAPHICAL SOURCEBOOK OF COMPRESSED AIR, DIVING AND SUBMARINE MEDICINE, VOLUME II, by Ebbe Curtis Hoff and Leon Jack Greenbaum, Jr. Rept. for 1 Jan 50-31 Dec 51 on Contract Nonr-199(00). Nov 54, 379p. 3,807 refs. NAVMED P-5033.
Order from LC mi$11.10, ph$57.60 PB 149 819

This report released for sale to the public 26 Aug 60.

The literature cited in the present volume comprises pertinent unclassified reports and documents as well as published books, monographs, and papers appearing between January 1946 and December 1951.

Pharmacology and Toxicology

[Army Chemical Warfare] Labs., Army Chemical Center, Md.
COLLECTION OF GB VAPOR FROM EXPIRED AIR DURING SIMULATED RESPIRATION AND THE DETERMINATION OF LOSSES OF GB BY SORPTION ON SURFACES OF A ONE-WAY VALVE SYSTEM, by James W. Crook, William S. Koon and others. Mar 54, declassified 17 Oct 58, 16p. 8 refs. Medical Labs. Research rept. no. 252.
Order from LC mi$2.40, ph$3.30 PB 146 547

No direct evidence was found indicating an appreciable loss of GB from air passing through the one-way valve system. The rate of airflow was from 1-50 l./min., and the GB vapor concentration was from 0.12 to 1.3 mg./m^3. The use of cotton gauze treated with isopropyl alcohol is an excellent media for collecting GB vapor from expired air. The resistance offered against breathing is low and is not perceptible to man. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
CUMULATIVE TOXIC EFFECTS OF REPEATED DOSES OF INHALED GB VAPOR IN DOGS, by Paul Cresthull, Leslie Williams, and others. Apr 60, 20p. 11 refs. CWLR-2384. AD-236 945.
Order from LC mi$2.40, ph$3.30 PB 148 908

Dogs were given repeated exposures to GB vapor by inhalation for approximately 2 minutes in order to determine the cumulative toxic effects when exposures were daily or every other day. Doses averaging 10 to 13, 20, and 23 to 28 μg/kg per exposure were given. A detailed record of toxic signs and RBC-ChE effects resulting from each exposure was kept. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
EFFECTS OF 1-1'-TRIMETHYLENEBIS(4-FORMYLPYRIDINIUM BROMIDE) DIOXIME (EA 1814) ON ChE ACTIVITY AND NEUROMUSCULAR BLOCK IN RATS FOLLOWING POISONING WITH GB AND DFP, by Joseph H. Fleisher, Paul J. Killos and others. Apr 60, 24p. 23 refs. CWLR-2392.
Order from LC mi$2.70, ph$4.80 PB 148 910

Neuromuscular blockade following poisoning with DFP is rapidly antagonized by the bis-quaternary oxime, EA 1814, in vitro and in vivo. Concurrent study of the ChE activity of rat diaphragm following the addition of EA 1814 shows greater recovery of ChE activity of intact than of homogenized diaphragm muscle. No reactivation of brain ChE activity was found following EA 1814 treatment of GB poisoned rats, a result consistent with the apparent inability of quaternary compounds to penetrate the blood barrier, and the potentiating action of atropine on the chemotherapeutic effectiveness of EA 1814 demonstrated previously. (Author)

[Army] Chemical Warfare Labs., Army Chemical Center, Md.
INHIBITION OF RED BLOOD CELL CHOLINESTERASE AND RETENTION OF GB IN ANESTHETIZED DOGS EXPOSED TO GB VAPOR AT VARIOUS RATES OF PULMONARY VENTILATION, by Francis N. Marzulli, John F. Callahan, and Doris L. Steiner. Technical rept. 3 May 56, declassified 19 Aug 59, 25p. 10 refs. Chemical Warfare Labs. rept. no. 2020.
Order from LC mi$2.70, ph$4.80 PB 146 459

Anesthetized dogs, exposed in the laboratory to 4 to 10 µg. GB vapor/kg. by the oronasal route, retained 96 to 98% of the inhaled agent independent of ventilatory rate. Tracheal valves employed during the administration of the vapor served to eliminate mask dead space. In experiments involving a retained dose of 10 µg. GB/kg., RBC ChE (Red blood cell cholines terase) was significantly less inhibited where the ventilatory rate was increased 2-fold or greater. This effect was not found at a dose of only 4 µg. GB/kg. Both laboratory and field results demonstrated that the amount of intoxication is directly related to the minute volume at the time of the inhalation exposure. (Author)

[Army Chemical Warfare] Labs., Army Chemical Center, Md.
QUANTITATIVE PHYSIOLOGICAL STUDIES OF GB, by Francis N. Marzulli, Paul F. Robinson and others. Sep 51, declassified 28 Mar 58, 40p. 16 refs. Medical Labs. Research rept. no. 85.
Order from LC mi$3.00, ph$6.30 PB 146 548

In the first series of experiments, 17 anesthetized dogs were subjected to the inhalation of GB. Dosages from 0.2 to 37 micrograms (mmg.)/kg. were inhaled directly into the lower respiratory tract. The calculated retained GB varied from 27 to 97%, the average retention for all experiments being about 73%. In a second series of experiments, inhaled air was passed through one lumen, so that it contacted the animal at the bifurcation of the trachea. The animals retained 89 to 99% of the inhaled agent, the average retention for all members of the group being 95%. The Ct (Lethal index) values ranged from 48 to 121 mg. min./m^3. These dosages reduced the RBC-ChE (Red blood cell cholinesterase) to 15-84% of the initial value. In experiments involving 9 anesthetized dogs, gas-laden air, inhaled in the upper respiratory tract, was led through a by-pass from the trachea to a GB adsorber, back to the lower trachea and thence to the lungs. It was found that 95-100% of the inhaled GB, varying from 160 to 916 gamma, was retained by the upper respiratory tract. Dosages of GB up to about 3 mmg./kg. produced no fall in RBC-ChE when GB was injected or when it was inhaled.

Pfleiderer, Gerhard.
CHEMISTRY OF SNAKE VENOMS, by Gerhard Pfleiderer. Final technical status rept. for 1 Mar 59-29 Feb 60 on Contract DA 91-591-EUC-1089.[1960] 7p.
Order from LC mi$1.80, ph$1.80 PB 149 337

The investigations were concerned with the chemistry of the cobra and rattlesnake venoms in the following three specific research areas: (1) isolation and study of the cobra (Naja nivea) venom toxic peptides; (2) isolation of two phosphoric acid ester hydrolyzing enzymes from cobra venom and investigation of their biochemical and toxic properties; (3) separation of rattlesnake (Crotalus atrox) venom proteinases and determination of their specificities.

Radiobiology

Institute of Engineering Research, U. of California, Berkeley.
THE MEDICAL PROBLEM OF EXPOSURE TO EXTERNAL RADIATION IN A FALLOUT FIELD: THE CONCEPT OF PARTIAL EXPOSURE AND FRACTIONIZATION AND PROTRACTION OF DOSAGE COMPARED TO THE CONCEPT OF WHOLE BODY RADIATION AND ACUTE EXPOSURE, by Crawford F. Sams. Rept. on Civil Defense Research Project, Contract CD-SR-58-40. 30 June 59, 207p. 280 refs. Series no. 2, issue no. 24.
Order from LC mi$9.30, ph$31.80 PB 149 930

Analysis of the dosimetry factors indicate the need for a new method of computing dosage through integration of varying energy levels absorbed at more than one point within the body. Emphasis was given to the effect of energy absorption on the more highly specialized tissues in the body, such as the central nervous system and the endocrine glands. The application of external energy to these highly specialized tissue results in an initial accelerating effect through a change in dissociation constants. In the central nervous system this affects the rate at which the conversion of chemical into electrical energy occurs. In hormonal glands, which together with the central nervous system, control entire body metabolism, the rate of synthesis of hormones from substrates is correspondingly affected. In low dose exposures, it appears that the acceleration phase of the biologic response curve may not go into the depressive phase. A new list of the comparative radio-sensitivity of tissues responding functionally to radiation has been presented. The functional response of highly specialized tissues may account for the preventive effect of various substances injected prior to radiation and their subsequent non-effectiveness when injected during the depressive phase of the biologic response curve. Analysis of available data on partial exposures, and fractionation or protraction of dosage, indicate that in terms of lethality the order of magnitude of lethal dosages is increased by greater than a factor of 10.

Radiobiological Lab., U. of Texas, Austin.
THE EFFECT OF ACUTE DOSES OF NUCLEAR RADIATION ON THE PERIPHERAL BLOOD PICTURE OF THE MONKEY (MACACA MULATTA), by Thomas P. Leffingwell, George S. Melville, Jr. and Quentin L. Hartwig. Apr 60, 13p. 19 refs. AFSAM rept. 60-43.
Order from LC mi$2.40, ph$3.30 PB 149 244

Male Macaca mulatta monkeys were exposed to three different doses of combined neutron and gamma radiations which derived from an uncontrolled nuclear reaction. Changes which were observed in the peripheral blood picture may be attributed solely to the effects of the ionizing radiations to the 1 percent confidence limit.

Results, compared with those obtained by other investigators, show the hematologic effects of neutron-gamma exposure to be similar to those resulting from exposure to x-radiation. (Author)

Radiobiological Lab., U. of Texas, Austin.
EFFECTS OF RARE-EARTH NITRATE AND OXIDE ON IRRADIATED AND NONIRRADIATED RATS, by George S. Melville, Jr. and Robert W. Riess.
June 60, 10p. 4 refs. AFSAM 60-26.
Order from LC mi$1.80, ph$1.80 PB 149 352

Two salts of a rare-earth mixture were given to rats both intraperitoneally and subcutaneously: In addition, certain of the groups so treated received 800 r of gamma rays regardless of route of administration of the chemical. With or without irradiation, rare-earth nitrate was more damaging to the animals than rare-earth oxide. Animals which received the more soluble nitrate deomonstrated diarrhea, anorexia, and "fluffing." These symptoms, which were not seen in the rare-earth oxide animals, subsided in approximately 7 days. When given subcutaneously, the nitrate caused abscesses which healded in 30 days and the oxide caused nodules which disappeared slowly. Mortality was higher in the irradiated groups of animals. (Author)

CHEMISTRY

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
LITHIUM HYDRIDE, by M. A. Hyla. 20 Feb 48, 27p. 20 refs. NEPA 425.
Order from LC mi$2.70, ph$4.80 PB 149 769

This report released for sale to the public 25 Aug 60.

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Property data
Fabrication data
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Equilibrium studies with other elements and compounds
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Nuclear data
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Analytical Chemistry

Fowles, G. W. A.
A STUDY OF THE CHEMICAL PROPERTIES OF THE COMPLEX NITROGEN, PHOSPHORUS, OXYGEN, AND SULPHUR COMPOUNDS OF THE TITANIUM, VANADIUM, AND CHROMIUM SUB-GROUP METALS, by G. W. A. Fowles and E. Cartmell.
Annual Final technical rept. no. 2, 1 May 59-30 Apr 60, on Contract DA 91-591-EUC-1126, continuation of Contract DA 91-508-EUC-307. [1960] 21p.
Order from LC mi$2.70, ph$4.80 PB 149 423

The work is divided into two sections, one dealing with complexes of quinquevalent molybdenum, and the other with complexes of ter- and quadri-valent titanium. In each case the complexes are those prepared by reacting the halides of the metals with amines - usually aliphatic. Work is described on the reaction of molybdenum (V) chloride with tertiary amines (NR_3, with R = Me, and Et), with secondary amines (NHR_2, with R = Me, Et, and n-Pr), and with primary amines (NH_2R, with R = Me, Et, n-Pr, and n-Bu). The interaction of molybdenum (V) chloride with several aromatic amines, and oxygen and sulphur compounds is briefly reported. A number of complex oxychloro compounds of molybdenum (V) have been made. The reaction of titanium (IV) chloride with primary (NH_2R, R = Me, Et, and Pr^n), and secondary amines (NHR_2, R = Me, and Et) and of titanium (IV) bromide with methylamine and dimethylamine are reported. (See also PB 143 110)

North Carolina U., Chapel Hill.
APPLICATIONS OF COMPLEMENTARY TRISTIMULUS COLORIMETRY, by Charles N. Reilley and Ellis M. Smith. UNC Technical rept. Chem. no. 5 on Contract AF 49(638)333. 9 May 60, 34p. 4 refs. AFOSR-TN-60-497; AD-240 176.
Order from LC mi$3.00, ph$6.30 PB 149 582

The principles of complementary tristimulus colorimetry have been extended in mathematical form to several problems of analytical interest. Colorimetric analysis of multicomponent mixtures is one possible application. While the analysis of a single component is trivial, the use of complementary tristimulus colorimetry in the case of two and three components with overlapping spectra is feasible. The technique has the advantage that more than the minimum number of wavelengths can easily be employed. While the tristimulus approach is limited to a maximum of three components, an analogous multi-stimulus approach can be used for a system containing more components more components. Other applications include calculation of the pK's of acids, and the formula and stability constant of complex ions. As an aid in computation, an inexpensive analog computer was built which permits calculation of chromaticity coordinates (by the weighted ordinate method at 10 selected wavelengths) in about 2 to 3 minutes. (Author)

Organic Chemistry

Fordham U., New York.
SYDNONES. III. PREPARATION AND INTERCONVERSATION OF MERCURATED DERIVATIVES OF N-(3-PYRIDYL)SYDNONE, by Jack M. Tien and L. Moyer Hunsberger. Rept. on Contract AF 18(603)127.
31 May 60, 19p. 33 refs. AFOSR-TN-60-583; AD-239 167.
Order from LC mi$2.40, ph$3.30 PB 148 877

Mercuration of N-(3-pyridyl)sydnone (II) has produced either the sydnone-mercuric chloride "adduct" (V), C-chloromercuri-N-(3-pyridyl)sydnone (VI), or C,C'-mercuri-bis-[N-(3-pyridyl)sydnone] (VII), depending on the reaction conditions. The adduct (V) has been converted to VI and to VII. Transformation of VI to VII was accomplished in pyridine solution at room tem-

perature, while VII was converted to VI with excess mercuric chloride. All reactions proceeded in high yield. Sydnones undergo electrophilic substitution virtually as easily as thiophene. Objections to the tropone-like formulation (XI) of sydnones are presented. Preparation of N-(3-pyridyl)glycine hydrochloride via a Strecker-type reaction between 3-aminopyridine and glycolonitrile is more convenient than the earlier process and permits the preparation of large quantities of sydnone II. (Author)

Gates and Crellin Labs. of Chemistry, Calif. Inst. of Tech., Pasadena.
THE IONIZATION OF CITRIC ACID STUDIES BY THE NUCLEAR MAGNETIC RESONANCE TECHNIQUE, by A. Lowenstein and John D. Roberts. Technical rept. no. 5 on Contract Nonr-220(26). 1 Sep 59, 24p. 12 refs. AD-225 556.
Order from LC mi$2.70, ph$4.80 PB 148 860

The chemical shift of the methylene hydrogens in citric acid was measured as a function of the pH and the concentration of the solution. From these measurements it was possible to evaluate the chemical shifts associated with each ionization step in citric aicd. Measurements were also made of methylene resonance line positions for ionized and non-ionized methyl esters of citric acid. Analysis of the results indicates that the first and second ionizations of citric acid take place predominantly at the terminal carboxyl groups. (Author)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
THE MECHANISM OF THE REIMER-TIEMANN REACTION, by Jack Hine and James M. Van Der Veen. Technical rept. no. 4 on Contract Nonr-991(03). 6 May 59, 23p. 21 refs.
Order from LC mi$2.70, ph$4.80 PB 146 605

Chloroform reacts with aqueous sodium phenoxide only very slowly at 35°, but in the presence of sodium hydroxide it reacts rapidly to give ortho- and para-hydroxybenzaldehydes (the Reimer-Tiemann reaction). This observation shows that the Reimer-Tiemann reaction is not initiated by the nucleophilic attack of phenoxide ion on chloroform. The reaction instead appears to involve the reaction of chloroform with hydroxide ion to give dichloromethylene which then reacts with phenoxide ion. From the effect of sodium phenoxide concentration on the yields of aldehydes, the relative rate constant for the combination of dichloromethylene with the oxygen atom as well as the ortho and para carbon atoms of the phenoxide ion may be calculated (relative to the rate constant for combination with water). (Author)

Southampton U. (Gt. Brit.)
A STUDY OF THE EFFECT OF SUBSTITUENTS AND OF SOLVENT ON THE REACTIVITY OF THE NORMAL AND ABNORMAL POSITIONS OF UNSYMMETRICAL ORGANIC EPOXIDES, by R. E. Parker. Annual technical rept. for 1 May 59-30 Apr 60 on Contract DA 91-591-EUC-1127. 25 May 60, 13p. 16 refs; AD-238 719.
Order from LC mi$2.40, ph$3.30 PB 149 424

For the investigation of the effect of substituents on the reactivity of the normal and abnormal positions of unsymmetrical epoxides, a kinetic study has been made of the reactions of various m- and p- substituted styrene oxides with benzylamine in ethanol. For the investigation of the effect of the solvent on the reactivity of the normal and abnormal positions of unsymmetrical epoxides, the reaction between styrene oxide and benzylamine has so far been studied kinetically at three temperatures in methyl cyanide and methanol, and at one temperature in tert-amyl alcohol.

Washington, U., Seattle.
UNIMOLECULAR DECOMPOSITION OF CHEMICALLY ACTIVATED ETHYL-d_2 RADICALS FROM H ATOMS PLUS trans-ETHYLENE-d_2, by B. S. Rabinovitch, D. H. Dills and others. Technical rept. no. 3 on Contract Nonr-477(14). 15 Sep 59, 24p. 18 refs. AD-226 337.
Order from LC mi$2.70, ph$4.80 PB 148 859

Addition of H atoms to trans-ethylene-d_2 produces chemically activated ethyl-d_2 radicals. This choice of the reactant ethylene permits all subsequent secondary processes of the hot ethyl radicals to be counted. The system has been studied between -78° and 160°C, and in most detail at room temperature, as a function of ethylene pressure. Experimental details are similar to those given in previous work on butyl. The relative energy spread of the formed ethyl radicals is here effectively greater than that observed for butyl radical since the thermal spread is not superimposed upon a minimum excess above the critical energy, as was the case for butyl. Nevertheless, relative to high temperature thermal decompositions, the product ethyl radicals are comparatively mono-energetic, especially at the lowest temperature. The observed rate constant for decomposition k_a was evaluated from the amounts of stabilization vs decomposition by C-H rupture. The decomposition rate is compared with theoretical expressions. A very crude average isotopic rate ratio for transfer of H and D in the disproportionation of ethyl-d_2 radicals is 6:1 at 25°. (Author)

Physical Chemistry

Aircraft Propulsion Lab., U. of Michigan, Ann Arbor.
RECENT RESULTS OF STANDING DETONATION WAVES, by J. A. Nicholls and E. K. Dabora. Rept. on Contract AF 49(638)562. May 60, 32p. 19 refs. 2874-5-T; AFOSR-TN-60-441; AD-238 393.
Order from LC mi$3.00, ph$6.30 PB 148 528

The objective of this report is to present the aerodynamic and chemical criteria important to the establishment of standing detonation waves, and to present some recent experimental data. (Author)

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DEPOSITION OF A SINGLE CRYSTAL THIN FILM OF GERMANIUM ON ROCK-SALT BY EVAPORATION, by Donald J. Kay. Master's thesis. Sep 59, 50p. 26 refs. GE-59-B-#10; AD-228 288.
Order from LC mi$3.30, ph$7.80 PB 149 291

Thin films of germanium deposited by evaporation in a vacuum on a rock-salt substrate possess single crystal characteristics. Electron diffraction patterns obtained show this single crystal structure of the deposit. The (100) plane of rock-salt has a 0.355% degree of misfit to the (100) plane of germanium. This is within the 9% maximum misfit allowed for epitaxial growth. Temperature control of the rock-salt substrate is necessary to insure orientation and continuity of the film. Various forms and materials for an evaporation source were unsatisfactory because the molecular ray did not include the desired area for the deposition nor could the materials withstand the desired temperatures. (Author)

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
MEASUREMENT OF LAMINAR FLAME SPEEDS OF ETHYLENE-AIR AND PROPANE-AIR MIXTURES BY THE DOUBLE KERNEL METHOD, by S. D. Raezer and H. L. Olsen. Rept. on Contract NOrd 7386. June 59, 23p. 8 refs. CM-951; AD-225 994.
Order from LC mi$2.70, ep$6.30 PB 150 324

A new method of measuring laminar flame speeds of combustible gas mixtures is described. Flame speeds thus obtained for a range of ethylene-air and propane-air mixtures were compared with those obtained by the flame-kernel technique. The results suggest that the calculated adiabatic flame temperatures may be higher than the actual values by as much as 15 per cent for both gas mixtures. (Author)

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
MOLECULAR DIFFUSION STUDIES IN BINARY GAS SYSTEMS, by Ronald E. Walker (Doctoral thesis) and Arthur A. Westenberg. Rept. on Contract NOrd-7386. Aug 58, 62p. 43 refs. Bumblebee Series rept. no. 279; AD-227 550.
Order from LC mi$3.90, ph$10.80 PB 149 556

Experimental apparatus and technique for a new method of measuring the diffusion coefficients of gases are described and critically discussed. The method makes use of the steady injection of a trace gas from a fine, hypodermic tube (essentially a point source) into a slow, uniform, laminar stream of a second (carrier) gas. Measurements of the trace gas concentrations downstream permit the binary diffusion coefficient to be determined. Results of about ±1% precision over the temperature range 300-1150°K are presented for the systems He-N_2 and CO_2-N_2. These results are discussed in terms of intermolecular potential energies. The He-N_2 data, including extremes of concentration, can be satisfactorily represented by a purely repulsive potential. At their upper temperature limit, the data come within 150° of overlapping the range of validity for the diffusion coefficient predicted from the repulsive potential obtained by Amour et al. from molecular scattering experiments. A slight extrapolation indicates remarkable agreement between the types of experiments. A modified Buckingham (Exp-Six) potential is obtained which covers both the diffusion and scattering potentials. For CO_2-N_2, the data are fitted with a Lennard-Jones (6-12) potential. For both gas systems the predictions derived from viscosity parameters for the pure components and simple combining rules are quite unreliable at high temperatures. (Author)

Arizona State U., Tempe.
THERMOELECTRIC MATERIALS AND DEVICE RESEARCH, by B. R. Gossick and H. B. Whitehurst. Quarterly progress rept. no. 2, 18 Dec 59-17 Mar 60, on Contract DA 36-039-sc-85249. [1960] 11p. 5 refs. AD-236 106.
Order from LC mi$2.40, ph$3.30 PB 149 381

A description is presented of the methods which were developed for making and testing sintered pellets of polycrystalline rutile. The problems encountered in making these samples to contain dispersed metallic phases of colloidal dimensions are described together with the possible methods of overcoming these difficulties. A description of the device to measure thermoelectric power is included with a schematic diagram of the experimental apparatus now under construction. (Author) (See also PB 148 342)

Atlantic Research Corp., Alexandria, Va.
ELEMENTARY TREATMENT OF EXTINCTION OF A GASEOUS DIFFUSION FLAME, by Raymond Friedman. Rept. on Project Squid, Contract Nonr-1858(25). Feb 59, 16p. 6 refs. Technical rept. ARC-4-P.
Order from LC mi$2.40, ph$3.30 PB 146 543

A complete mathematical description is made of an extremely crude approximation of a flame which is nevertheless self-consistent and includes the features of finite reaction rate, diffusion coefficient, and heat transfer coefficient.

Boston U., Mass.
NONDEGRADATIVE REACTION OF "ACTIVE NITROGEN" WITH CONJUGATED DIENES, by Akira Tsukamoto and Norman N. Lichtin. Rept. on Contract AF 49(638)2. 3 June 60, 4p. 4 refs. AFOSR-TN-60-607. AD-239 940.
Order from LC mi$1.80, ph$1.80 PB 149 219

Brown U. Div. of Engineering, Providence, R. I.
FINAL REPORT, by J. Kestin. Technical rept. no. 13, 1 Oct 53-1 Oct 59, on Contract AF 18(600)891. Mar 60, 9p. AF 891/13; AFOSR-TR-60-53; AD-238 994.
Order from LC mi$1.80, ph$1.80 PB 148 819

A completely new analytic theory has been developed for the oscillating disk type viscometer. Two viscometers were designed and built in the laboratory. One was adapted for work at moderate pressures but room temperatures. The second instrument was adapted for work at elevated temperatures (up to 300°C). Measurements were made and reliable data were collected on the viscosity of about 15 gases and one system of mixtures (N_2-CO_2).

Cornell U., Ithaca, N. Y.
KINETICS OF REACTIONS IN SHOCK TUBES, by S. H. Bauer. Rept. on Research in Molecular Energy Exchange Processes, Contract AF 33(616)3839. Apr 60, 109p. 9 refs. WADD Technical rept. 60-107.
Order from OTS $2.50 PB 161 904

The objective of this research program was to measure the rates, study the mechanisms of the pyrolysis

of gases at high temperatures, and to obtain experimental data on the efficiencies of energy transfer between molecules during collisions. The following papers are included: Intense Schumann-Runge source, pub. in J. Opt. Soc. Am., 49, 102 (1959); kinetics of the production of C_2 during the pyrolysis of ethylene; the equilibrium composition of the C/H system at elevated temperatures; a survey of the methods for the chemical analysis of transient species with mocrosecond resolution; and the rate of dissociation of cyanogen, estimation of the C-C bond dissociation energy.

Florida U. Engineering and Industrial Experiment Station, Gainesville, Fla.
FLUOROCARBON NF COMPOUNDS, by J. A. Young and R. D. Dresdner. Quarterly technical rept. no. 4 for 1 Apr-30 June 60, on Contract DA 01-009-ORD-772. [1960] 16p. 2 refs. ARPA Order no. 40-59, Task 3; [OOR rept. 007.4-C]
Order from LC mi$2.40, ph$3.30 PB 148 884

Nuclear magnetic resonance data are given for the compound previously obtained by CsF catalyzed addition of c-$C_5F_{10}NF$ to $CF_3CF{=}CF_2$. The product, obtained in good yield, was identified as perfluoro-N-methylpiperidine. No reaction was observed between NF_3 and SF_4 at 100-150° in a closed vessel or at 300 to 500° in a flow system. It was found, however, that NF_3 and SF_4 form a solid addition compound at low temperatures. Thermal decomposition of the mercury derivative of N,N'-bis(trifluoroacetyl) hydrazine under vacuum at 350-400° gives a product very tentatively identified as a substituted oxadiazolone. Formation of N-F compounds by cleavage of acyl groups from nitrogen has been extended to perfluorodimethylacetamide. As usual, both the fluoroamine and the coupled product are found. Fluorination of N-bromoperfluoroglutarimide gives a fairly stable silver fluoride complex, which may then react further to give $FCO(CF_2)_3NCO$. Evidence is given regarding the identification of the rearrangement product of the bromoimide as the ω - bromoacyl isocyanate, $Br(CF_2)_3CONCO$. (Author) (See also PB 147 006)

Gas Dynamics Lab., Northwestern U., Evanston, Ill.
THE KINETICS OF GASES, by Thomas P. Anderson, Richard F. Hoglund and Ali Bulent Cambel, eds'. Rept. on Contract AF 40(600)748. July 60, 156p. 135 refs. AEDC-TN-60-130.
Order from OTS $3.00 PB 161 908

The fundamental features of real gas effects are reviewed with emphasis on high temperature effects. Topics considered include the thermal and caloric equations of state, basic effects in flow processes, and the speed of sound in reacting gases. The kinetics of the processes of dissociation and recombination and ionization and charge neutralization are discussed along with some applications. Analyses are presented describing chemical non-equilibrium effects in some flow situations, among them inviscid flow after sudden changes in fluid properties and the mixing of parallel streams. (Author)

George Washington U., Washington, D. C.
THE REACTION BETWEEN METALLIC POTASSIUM AND CARBON MONOXIDE I. PRECURSERS OF POTASSIUM SALT OF HEXA-HYDROXYBENZENE, by W. F. Sager, Alexander Fatiadi and others. Rept. on Contract AF 49(638)325. 5 July 60, 16p. 9 refs. AFOSR-TN-60-653; AD-239 216.
Order from LC mi$2.40, ph$3.30 PB 148 881

Measurement of heats of fusion, melting points and magnetic susceptibilities have been made on potassium-carbon monoxide reaction products of various compositions. These measurements indicate consecutive formation of two intermediate reaction products of empirical formulae $K_3C_2O_2$ and KCO which form prior to the reported final product which is the potassium salt of hexahydroxybenzene. (Author)

Louisiana State U., Baton Rouge.
DOUBLE LAYER STRUCTURE AND ELECTRODE PROCESSES WITH A PRECEDING CHEMICAL REACTION, by Hiroaki Matsuda. Technical rept. no. 36 on Contract Nonr-300(00). July 59, 16p. 11 refs. AD-225 752.
Order from LC mi$2.40, ph$3.30 PB 148 730

An analysis is made of the influence of the double layer structure on electrode processes with a pseudo-first order preceding chemical reaction in which a non-reducible (non-oxidizable) substance (Y) is transformed into a reducible (oxidizable) one (O) in presence of a large excess of another reactant (X).

Louisiana State U., Baton Rouge.
DOUBLE LAYER STRUCTURE AND RELAXATION METHODS FOR FAST ELECTRODE PROCESSES: THE DOUBLE PULSE GALVANOSTATIC METHOD, by Hiroaki Matsuda and Paul Delahay. Technical rept. no. 35 on Contract Nonr-300(00). July 59, 20p. 13 refs. AD-225 751.
Order from LC mi$2.40, ph$3.30 PB 148 731

An equation is derived for the overvoltage-time characteristic in the double pulse galvanostatic method, the structure of the double layer being considered in the boundary value problem. Abnormally high transfer coefficients recently reported by other investigators are interpreted. A detailed mathematical analysis is given.

Louisiana State U., Baton Rouge.
INFLUENCE OF REACTANT ADSORPTION IN TRANSIENTS METHODS FOR FAST ELECTRODE PROCESSES, by Hiroaki Matsuda and Paul Delahay. Technical rept. no. 39 on Contract Nonr-300(00). Oct 59, 23p. 12 refs.
Order from LC mi$2.70, ph$4.80 PB 149 477

The effect of adsorption of the discharged species is considered in galvanostatic and potentiostatic methods, the reaction products being not adsorbed. It is shown that extrapolation methods for the determination of exchange current densities still apply but that the slopes of the resulting linear plots differ from their values in the absence of adsorption. Exchange current densities obtained by such extrapolation methods are formal quantities which depend on adsorption charac-

teristics. Separation of the adsorption terms appears quite difficult. The following results are derived for application of the extrapolation methods: equation of potential-time curves in the single pulse galvanostatic method; equation for the potential at the end t_1 of the first pulse for potential-time curves with a horizontal tangent at t_1 in the double pulse galvanostatic method; and equation of current-time curves in the potentiostatic method. (Author)

Louvain U. (Belgium).
EXPERIMENTAL INVESTIGATION ON THE KINETICS OF FLAME INHIBITION, by A. Van Tiggelen. Final technical rept. no. 2, 1 Mar 59-29 Feb 60, on Contract DA 91-591-EUC-1072. Mar 60, 45p. 17 refs.
AD-234 395.
Order from LC mi$3.30, ph$7.80 PB 147 254

The influence of Cl in H-O flames: Small amounts of Cl inhibited H-O flames more efficiently than conventional diluents such as N, but larger amounts accelerated the flame in rich mixtures. Almost no inhibition was observed when the composition corresponded to the mixing of two separate binary flammable mixtures (one of which contained Cl and H) which had compositions corresponding to the maximum burning velocity. The results were too erratic to allow definite conclusions to be drawn. Inhibition effects in ethylene-vinyl chloride-O flames: Small inhibition was observed. A continuous change occurred in the activation energy of the branching process passing from a pure ethylene to a pure vinyl chloride flame. Comparative study of ionization in ethylene and vinyl chloride flames: The total concentration of ions in both flames was nearly the same at a flame temperature of about 2500°K. At lower temperatures, ethylene flames contained more ions, while the vinyl chloride flame was more completely ionized at higher temperatures. Analysis of the flames by mass spectroscopy revealed HO_2^+ and $H_3O_2^+$ ions in the vinyl chloride flames, which were not present in the ethylene flames. This indicated a change in the reaction mechanism caused by the Cl. A new method is described for the determination of flammability limits which is based on the appearance of a stronger ionization in the premixed flames as compared to the diffusion flames.

Michigan U. Research Inst., Ann Arbor.
STABILIZATION OF GASEOUS DETONATION WAVES WITH EMPHASIS ON THE IGNITION TIME DELAY ZONE, by J. A. Nicholls. Technical note on Contract AF 49(638)562. June 60, 167p. 46 refs. 2874-6-T; AFOSR-TN-60-442; AD-240 064.
Order from LC mi$7.80, ph$25.80 PB 149 305

The characteristics of gaseous detonation waves are considered insofar as they influence the dynamic conditions that must be met in order to generate a standing gaseous detonation wave. Experiments are described werein stationary shock wave-combustion configurations were realized. A theoretical analysis of the ignition delay zone of hydrogen-oxygen combustion is presented. The main results of this study are: (1) standing detonation waves have been successfully generated; such waves offer many advantages to the study of combustion processes and represent a possible mode of combustion in hypersonic ramjets; (2) a new experimental technique for the study of ignition time delays of gaseous mixtures at high temperatures has evolved; other applications to chemical kinetic problems are possible; (3) a theoretical prediction of ignition time delay of hydrogen-oxygen mixtures is presented which is consistent with the experimental results of this investigation as well as those of other investigations.

Midwest Research Inst., Kansas City, Mo.
THERMAL PROPERTIES OF METHYL BORATE, by C. E. Hansen and R. L. Hughes. Rept. on Project Zip, Callery Chemical Co. Contract NOa(s) 58-454-d. 2 Feb 59, 48p. 11 refs. CCC-454-TR-303.
Order from LC mi$3.30, ph$7.80 PB 150 307

This report released for sale to the public 19 Sep 60.

This report is a continuation of the physical properties program for methyl borate. Pressure-temperature-enthalpy data are presented here, together with the Joule-Thomson effect and the heat of vaporization. Thermodynamic charts and tables have been prepared from the experimental data, and these data have been extrapolated over regions not covered experimentally. (Author)

Midwest Research Inst., Kansas City, Mo.
VAPOR PRESSURE AND CRITICAL CONSTANTS OF METHYL BORATE, by R. L. Hughes, A. R. Pittaway, and F. T. King. Rept. on Project Zip, Callery Chemical Co. Contract NOa(s) 58-454-d. 27 Mar 59, 16p. 3 refs. CCC-454-TR-307; AD-220 684.
Order from LC mi$2.40, ph$3.30 PB 150 308

This report released for sale to the public 19 Sep 60.

The vapor pressure versus temperature for methyl borate was measured from the normal boiling point to the critical point. The critical temperature was observed to be 229°C ± 0.5°C, and the critical pressure 502 psia (34 atmospheres). Log $P_{(mm.Hg)}$ vs. reciprocal temperature fits the equation:

$$\log P_{(mm.Hg)} = 7.6949 - \frac{1648.8}{T^{\circ}C}$$

The compressibility data of methyl borate were calculated from a modification of the generalized Beattie-Bridgemann equation of state. (Author)

National Bureau of Standards, Washington, D. C.
RAPID DETERMINATION OF THE ORDER OF CHEMICAL REACTIONS FROM TIME-RATIO TABLES, by Joseph H. Flynn. Aug 60, 23p. 7 refs. Technical note 62.
Order from OTS $0.75 PB 161 563

A table of ratios of reaction times corresponding to 15%/5%, 20%/10%, ..., 95%/85% reaction for orders of chemical reaction from -10 to +10 is presented. Use of this table allows the rapid calculation of the order of chemical reactions that are kinetically simple and involves only one subjective step. Methods are discussed for interpreting deviations from constant order resulting from errors in the initial times and concentrations, from errors in stoichiometry, and from the reaction following a more complicated rate expression. (Author)

Pennsalt Chemicals Corp., Wyndmoor, Pa.
AN INVESTIGATION OF CERTAIN THIOARSENATES, THIOANTIMONATES, THIOTUNGSTATES AND THIOMOLYBDATES, by Clair W. Graver and B. P. Block. Technical rept. no. 8 on Contract Nonr-2687(00). 1 Sep 59, 11p. 8 refs. AD-227 025.
Order from LC mi$2.40, ph$3.30 PB 148 865

Compounds with the composition $MM'S_4$, in which M and M' are As(III) and As(V), Sb(III) and As(V), Fe(III) and Sb(V), As(III) and Sb(V), Sb(III) and Sb(V), Pb(II) and Mo(VI), Zn(II) and Mo(VI), Ni(II) and Mo(VI), and Cu(II) and Mo(VI), have been prepared. Attempts to make $FeAsS_4$ and $ZnWS_4$, however, were unsuccessful. Thermal treatment alone or thermal treatment under pressure did not produce elastomeric plaques and in some cases led to decomposition. The compounds made, although undoubtedly polymeric, are not good prospects for elastomers. (Author)

Purdue U., Lafayette, Ind.
DISSOCIATION CONSTANTS OF THE ACID SALTS OF ETHYLENEDIAMETETRAACETIC ACID, by D. C. Olson and D. W. Margerum. Rept. on Contract AF 49(638)60. [1960] 14p. 11 refs. AFOSR-TN-60-603.
Order from LC mi$2.40, ph$3.30 PB 149 225

The fully protonated salt of EDTA, H_6YCl_2, is prepared. Its dissociation constants at 25.0° and an ionic strength of 2.0 are $K_{H_6Y^{++}} = 0.55$ and $K_{H_5Y^{+}} = 0.11$. The betaine structure for H_4Y is consistent with these and the other EDTA constants, while the constants do not fit the proposed tetra acetic acid structure for H_4Y. (Author)

Rome U. (Italy).
PRODUCTION OF DYE FREE ANODIC ALUMINUM COATINGS WITH THE USE OF ALTERNATING CURRENT. Rept. for 15 Feb 59-30 Apr 60 on Contract DA 91-591-EUC-1073. [1960] 14p.
Order from LC mi$2.40, ph$3.30 PB 149 426

The main object of this research has been the preparation of aluminum blacks by means of a circuit having a pre-established initial polarization with its different variants. The investigation aimed at studying the dependence of the degree of blackening of the aluminum blacks upon the following parameters: (1) pre-established initial polarization under variable initial current density; (2) initial current density variableness of the electrode upon which a deposit of the aluminum black type should form (owing to the variation of the electrode area ratio); (3) duration of an initial pulsing voltage of polarization equalling the initial polarization normally employed and followed by an alternating voltage after some cycles; (4) amplitude control of the peak voltages of the positive and negative half cycles; (5) aluminum quality; (6) chromic acid quality; (7) chromic acid contents of the bath at an approximately constant initial current density; and (8) sulphuric acid content of the bath.

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE MEASUREMENT OF THE VAPOR PRESSURE OF ATOMIC SPECIES FROM SPECTROMETRIC MEASUREMENTS OF THE ABSORPTION OF THE RESONANCE LINE. III. THE THERMODYNAMICS OF VAPORIZATION OF SODIUM FROM SODIUM SILICATE GLASSES, by G. L. Vidale. Rept. on Contract AF 04(647)269. June 60, 37p. 19 refs. Technical Information Series R60SD390.
Order from LC mi$3.00, ph$6.30 PB 148 764

The equilibrium constant of the reaction $Na_2O \cdot SiO_2(s, sol) = 2Na(g) + 1/2\ O_2(g) + SiO_2(sol)$ has been determined for sodium orthosilicate and for four glasses containing a molar excess of SiO_2. The vapor pressure of sodium atoms has been determined by absorption spectrophotometric measurements on the sodium 5890 Å resonance line. The results obtained are compared with other thermodynamic data avaliable for this system and are found to be consistent with them. The value of $P_{Na}\ P_{O_2}^{1/4}$ is given from 1200 to 2000°K for four glass compositions having a molar ratio of SiO_2 to Na_2O varying from 1.69:1 to 3.88:1. (Author)

Western Reserve U., Cleveland, Ohio.
BORON-NITROGEN COMPOUNDS, by Charles A. Brown and Lewis J. Schupp. Terminal rept. for Aug 52-June 54 on [Subcontract to Contract NOas-52-1023c] Aug 54, 36p. 9 refs. Technical research rept. MCC-1023-TR-65.
Order from LC mi$3.00, ph$6.30 PB 150 295

This report released for sale to the public 19 Sep 60.

The behavior of boron trifluoride and boron trichloride as Lewis type acids is demonstrated further by the formation of the addition compounds acetamide-BF_3, urea-BF_3, and urea-BCl_3. The low thermal stability of urea-BCl_3 compared to urea-BF_3 is due primarily to the ease with which hydrogen chloride is formed as a decomposition product as condensation occurs. The thermal decomposition of urea-BF_3 does not produce hydrogen fluoride, and the formation of boron-nitrogen polymers from this or similar substances does not appear to be promising. The phenylenediamines react readily with boron trichloride. In view of the ease with which hydrogen chloride is evolved from these adducts, the formation of new substances containing boron-nitrogen bonds appears to be possible.

EARTH SCIENCES

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
THE CRYOCONITE OF THE THULE AREA, by R. W. Gerdel and Francis Drouet. Nov 58, 20p. 6 refs. Research rept. 50; AD-217 599.
Order from LC mi$2.40, ph$3.30 PB 147 183

This report is also included in PB 146 026.

Allied Research Associates, Inc., Boston, Mass.
AN INTERPRETIVE CODE FOR THE WEATHER RADAR, by Roland J. Boucher. Scientific rept. no. 6 on Contract AF 19(604)5204. 10 Feb 60, 26p. 7 refs. AFCRC-TN-60-451.
Order from LC mi$2.70, ph$4.80 PB 149 152

An alpha-numerical code consisting of three basic six-letter-digit groups and two supplemental groups is described. The code is an operational one designed to supply the synoptic meteorologist with significant information on the immediate state of that portion of the synoptic situation within range of the radar. The code omits transitory details of echo configuration but gives general areas where echoes are found and a measure of their density. Stress is laid on the over-all echo character such as the texture on the PPI and the structure on the RHI, since these features relate to the dynamic processes. Two supplemental groups provide a means of transmitting accurate positions of squall lines and the position of the hurricane eye, as well as the speed and direction of movement of these important phenomena. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
BALLOON ASCENT RATE, LAPSE RATE, AND WIND CORRELATION, by J. T. Kurman and M. B. Sharenow. 20 Apr 59, 9p. USASRDL Technical rept. 2023; AD-220 786.
Order from LC mi$1.80, ph$1.80 PB 147 564

This report covers work completed in an effort to determine whether a correlation exists between balloon-ascent rate and the factors of lapse rate, winds speed, and wind direction. Balloon tests made and evaluation methods used are described. Further, an attempt was made to discover a possible relation between the passage of certain types of cold fronts and an increase in average ascent rate of a balloon. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
BALLOON BEHAVIOR EXPERIMENTS, by Gwendolyn L. Killen. 15 Jan 60, 29p. USASRDL Technical rept. 2093. AD-237 033.
Order from LC mi$2.70, ph$4.80 PB 148 539

A study was made of the balloon as a device for wind measurement. Experiments were conducted in which the trajectories of meteorological balloons were tracked when released in still air inside a closed building. It was found that the balloons developed aerodynamic lift forces which caused them to develop considerable horizontal components of velocity, and that these velocities varied with the amount and location of ballast below the balloon. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
AN IMPROVED VERSION OF A SIMPLE THUNDERSTORM WARNING DEVICE, by Joseph J. Krieg. 30 Mar 60, 14p. 3 refs. USASRDL Technical rept. 2105.
Order from LC mi$2.40, ph$3.30 PB 148 542

The device is based on the fact that the amplitude of the radiation component of the electric field associated with a lightning stroke decreases at a rate of 1/r. Sample results are discussed. (Author)

Cloud Physics Lab., U. of Chicago, Ill.
CLOUD REFRACTIVE INDEX STUDIES. PART III, by Edward L. Harrington. Final rept. on Contract AF 19(604)1931. 2 May 60, 101p. 4 refs. Cloud Physics Lab. Technical note no. 21; [AFCRC] TR-60-266.
Order from LC mi$5.70, ph$16.80 PB 149 310

Statistical analysis of refractive index gradients has been applied to some measurements made in the sub-cloud layers at altitudes from 1,000 ft to 3,000 ft over the Caribbean Sea. The data were arranged in bivariate frequency tables of ΔN versus ΔS and tests were made to determine if these distributions changed with respect to altitude and horizontal location, and to see if the distributions representing cloud air were different from the clear-air distributions. The distributions of ΔN show that over ninety per cent of the values are less than one N unit, reflecting the high humidity encountered at these altitudes. Autocorrelograms of three low-altitude passes are inconclusive because lag sizes were too large to detect the gradient activity and the records were too short for meso-scale variation to be verified. The integrated refractive index change along the aircraft flight path in cloud has been computed for a number of clouds from both the subtropical oceans and the continental United States. Gross refractive index measurements have been made on additional cloud samples. (See also PB 137 910)

Electrical Engineering Research Lab., U. of Texas, Austin.
RESEARCH DIRECTED TOWARD THE STUDY AND APPLICATION OF DIGITAL DATA-PROCESSING METHODS TO THE PROBLEM OF SENSING AND RECORDING METEOROLOGICAL VARIABLES AT VARIOUS LEVELS ON AN EXISTING 1400-FOOT TOWER, by W. S. Mitcham and J. R. Gerhardt. Final rept. on Contract AF 19(604)3498. 30 Apr 60, 19p. GRD-TR-60-283.
Order from LC mi$2.40, ph$3.30 PB 149 442

This report gives a broad survey of the operating, design and data utilization features of the meteorological tower system.

Free U. of Berlin (Germany).
WIND AND DENSITY DISTRIBUTION IN THE FREE ATMOSPHERE. Final technical rept. for 15 Apr 59-15 Apr 60 on Contract DA 91-591-EUC-1124. [1960] 13p; AD-238 746.
Order from LC mi$2.40, ph$3.30 PB 149 432

Complete basic data were compiled for a climatological study of the free atmosphere over several European areas. The available data were checked according to scientific principles, errors were corrected and missing reports supplemented as far as possible. The available sources of data are of different quality: original recordings and evaluations of soundings are first-

ranking; such records could only be secured from Berlin-Tempelhof. Publications based on original sounding records also give good data. Other sources, however, which are mainly a collection of data as received by radio or teletype facilities, are subject to a variety of errors, among which those arising with communication and printing are the most frequent. Since there is always a deadline to be met, these sources contain all kinds of other errors in addition. Thus, a careful checking is unavoidable. Even the official weather maps have often to be completed in a limited time and quite frequently with incomplete data coverage. A subsequent checking, therefore, with enough time given the employ all corresponding scientific principles, would result in a considerable improvement of the basic data.

Hawaii Inst. of Geophysics [Honolulu]
TROPICAL METEOROLOGY: RESEARCH AND TEACHING, by C. S. Ramage. Final rept. for 16 Aug 56-15 Mar 60 on Contract AF 19(604)1942. May 60, 30p. 21 refs. AFCRC-TR-60-249.
Order from LC mi$2.70, ph$4.80 PB 149 082

Investigations were made into problems of evapotranspiration, typhoon development and movement, geostrophic winds, analysis of wind-weather relationships, forecasting of upper winds, and the compilation of a most extensive Pacific and Far East synoptic data file. Classes in Advanced Tropical Meteorology were attended by experienced U. S. Government and SEATO meteorologists.

Ionosphere Research Lab., Pennsylvania State U., University Park.
IONOSPHERIC ELECTRON DENSITIES FOR WASHINGTON D. C., PANAMA, TALARA, AND HUANCAYO FOR OCTOBER-NOVEMBER-DECEMBER, 1958, by E. R. Schmerling. Scientific rept. no. 136 on Ionospheric Research, Contract AF 19(604)3875. 1 Aug 60, 262p. 3 refs. GRD-TN-60-497.
Order from LC mi$11.10, ph$41.10 PB 149 790

See also PB 142 411

Lees, Sidney, Cambridge, Mass.
STUDY ON WIND SHEAR MEASUREMENTS, by Sidney Lees. Final rept. for 1 Apr 57-30 Apr 58 on Contract DA 36-039-sc-73204. 31 May 58, 140p. 5 refs. AD-203 442.
Order from LC mi$6.90, ph$21.30 PB 149 409

The first chapter is a statement of the concepts and limitations of wind shear measurement in the atmosphere. The range of wind shear is estimated to be 0.001 to 0.1 inverse seconds. The uncertainty of wind shear measuring systems should be no greater than 0.001 inverse seconds. The second chapter reviews the work included in previous reports. The wind shear probe is described in Chapter 3. A program for developing the wind shear probe is given in Chapter 4. Various aspects of the theory are presented in Chapters 5, 6, 8, 9 and 10. Multiple airborne vehicle systems are discussed in Chapters 7, 12, and 13. A theory has been developed based on second differences that offers the possibility of measuring the change in displacement between two targets. The information can be obtained directly in Cartesian coordinates, so that all nine components of the velocity variation matrix can be computed. A program is presented in Chapter 7 for further work in this area.

MacDonald Physics Lab., McGill U. (Canada).
THE QUANTITATIVE DISPLAY OF RADAR WEATHER PATTERNS ON A SCALE OF GREY, by T. H. Legg. Doctoral thesis. Rept. on Contract AF 19(604)6617. June 60, 117p. 28 refs. Stormy Weather Group Scientific rept. no. MW-31; AFCRC-TN-60-466.
Order from LC mi$6.00, ph$18.30 PB 149 167

At 100 miles range, radar can detect variations of 10^4 in rainfall intensity; the signals cover 64 db in power of which many radars can display less than 16 db at a time. Equipment has been designed and studied which displays successive factors of signal power, corrected in a known way for distance, as equally discernable steps of grey. One gain control adjusts the factors to display at a given time all or a chosen fraction of the 64 db. The control is inserted between a logarithmic receiver and an exponential amplifier. Photographs of a radar screen, corrected optically to improve uniformity, have enough contrast for seven grey steps. A test pattern appears in each picture (Author)

McGill U. (Canada).
TEMPERATURE AND WIND FREQUENCY TABLES FOR EURASIA. VOL. 2. APRIL-JUNE, by J. N. Rayner. Rept. on Contract DA 19-129-qm-1447. May 60, 209p. Arctic Meteorology Research Group Pub. in Meteorology no. 20.
Order from LC mi$9.30, ph$31.80 PB 148 325

See also PB 148 324

Stanford Research Inst., Menlo Park, Calif.
CLOUD SHIELD AND RADAR PRECIPITATION ECHO RELATIONSHIPS WITH SATELLITE APPLICATIONS, by F. L. Ludwig and R. E. Nagle. Scientific rept. no. 1 on Contract AF 19(604)5982. Apr 60, 106p. 6 refs. AFCRC-TN-60-478.
Order from LC mi$5.70, ph$16.80 PB 149 791

Fifteen mid-United States composite radarscope pictures are presented showing radar precipitation echoes, frontal positions, and total cloud cover. These are accompanied by analyses of the low, middle, and high cloud shields. Thirteen other composites from West Coast and Picket Ship pictures are presented in an Appendix. These latter are without cloud analyses. Three strip composites using radarscope pictures, taken during aircraft reconnaissance flights over the eastern Pacific, are included with their corresponding cloud and frontal analyses. The fifteen cloud-analyzed continental composites and the reconnaissance composites are discussed in the text with respect to the cloud-precipitation relationships. The probable character of satellite photographs is discussed. Characteristics of the cloud patterns which seem, from the composite analyses, to be associated with precipitation or storm systems are discussed in terms of the likelihood that they could be discerned from satellite photographs. (Author)

Texas A. and M. Coll., College Station.
FORECASTING MICROMETEOROLOGICAL VARIABLES, by Guy A. Franceschini. Final rept. on Contract AF 19(604)2250. Dec 59, 73p. 4 refs. Reference 59-9F; AFCRC-TR-60-225.
Order from LC mi$4.50, ph$12.30 PB 149 010

An objective evaluation was conducted on the utility of a specialized analogue for micrometeorology. Values of parameters simulated by the computer are compared with values observed. Parameters of concern were: air temperature at a height equal to the roughness parameter (z_0); air temperature at 2 m; temperature difference between 1/2 m and 4 m; wind speed at 2 m; vapor pressure at 2 m; and relative humidity at 2 m. Results are shown in graphs of simulated and observed values as a function of time, and tables of statistical parameters of the verification. Comparisons were made for five (5) different periods involving four (4) locations. The locations, all in Texas, represented appreciably different surfaces. Meteorological conditions were varied and included the following air mass types: arctic, maritime polar, continental polar and maritime tropical. A brief description of each site with a summary of its attendant meteorological conditions is given. (Author)

Texas A. and M. Coll., College Station.
MICROMETEOROLOGICAL OBSERVATIONS OVER NON-IDEAL SURFACES, by Guy A. Franceschini. Scientific rept. no. 1 on Contract AF 19(604)2250. Dec 59, 197p. 1 ref. Reference 59-6S; AFCRC-TN-60-254.
Order from LC mi$8.70, ph$30.30 PB 149 009

The measurements reported herein were made primarily for the purpose of furnishing a basis for the evaluation of an analogue computer designed to simulate certain micrometeorological parameters in the "surface layer" of the atmosphere. A secondary purpose for making the observations was to furnish data on conditions over micrometeorologically non-ideal surfaces. (Author)

Woods Hole Oceanographic Institution, Mass.
MARINE METEOROLOGY: CLOUD AND ENVIRONMENT VERTICAL VELOCITIES, TEMPERATURES, HUMIDITIES AND WATER CONTENTS ASSOCIATEL WITH A SHEAR ZONE IN THE TRADE WINDS, by Andrew F. Bunker. Technical rept. no. 44 on Contract Nonr-1721(00). Sep 59, 34p. 18 refs. Reference no. 59-42; AD-226 030.
Order from LC mi$3.00, ph$6.30 PB 148 892

Airplane measurements of turbulent and convective vertical velocities of gusts with sizes from 60 to 6000 m were made during a 160 km flight through a clear area and a cloudy shear zone at a level about 50 m above cloud base. During the straight, level flight, 19 parcels, identified as cumulus clouds, were penetrated. These parcels were cooler than both the shear zone air and the clear air. Some clouds were observed with only downdrafts while others were observed with internal ascending parcels warmer than the cloud air. These and other characteristics substantiate the concept of one type of cumulus cloud as a semi-permanent mass of inactive air with occasional bubbles of buoyant air. The environment is nearly as turbulent as the cloudy air and contains extensive regions of updrafts and downdrafts. An east-west shear zone at 10°N was established by the penetration of a cold front into the North Atlantic Ocean trade winds. North of the shear line, the air was diverging, subsiding, and forming an oval area about 100 by 200 km which was free of cumulus clouds. The southern boundary of this area was defined by cumulus clouds building up to 2 km. From ship reports of wind velocity, the air in the clear area was found to be subsiding several tenths cm sec^{-1} while the air of the southern wall was ascending faster than 1 cm sec^{-1}. The divergence pattern in this area is found to be an extension of a larger pattern covering a part of the North Atlantic Ocean. (Author)

Frost Science

American Geographical Society, New York.
RECENT GLACIER VARIATIONS IN SOUTHERN SOUTH AMERICA, by Donald B. Lawrence and Elizabeth G. Lawrence. Technical rept. on American Geographical Society Southern Chile Expedition, 1959, Contract Nonr-641(04). Sep 59, 52p. 37 refs. AD-227 124.
Order from LC mi$3.60, ph$9.30 PB 148 893

Contents:
Glacier Fitz Roy
Glacier San Rafael
The historical evidence of glacier variation
The topographic and biologic evidence
Tree ring studies
Development of vegetation following recession of glaciers
Glacier Del Rio Manso
Comparison with Ameghino glacier, Argentina

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
EXPERIMENTAL STUDY OF FROST HEAVING, by Akira Higashi. Rept. on Dynamics of Frost Heaving. Aug 58, 24p. 6 refs. Research rept. 45; AD-214 672.
Order from LC mi$2.70, ph$4.80 PB 147 353

Laboratory studies on the effects of the soil-temperature regime on the type of ice segregation and the rate of frost heaving are described in detail, and the results are analyzed quantitatively on the basis of thermodynamic and hydraulic theory, assuming that suction is created by ice formation. The heaving rate varied with the type of ice segregation, which in turn depended on the rate of frost penetration. Ice-filament layers or sirloin-type freezing were observed at low penetration rates and concrete-type freezing at high penetration rates. The heaving rate decreased with increasing frost-penetration rate, and varied, in the case of filament-type freezing, according to the amount of sensible heat lost at the freezing interface. The sensible heat loss was 0.62 cal/cm-sec in the case of maximum heaving (7 mm/day); higher values resulted in thermal conditions favoring sirloin-type freezing. The moisture content of frozen soil was found to be related to the heaving ratio, inasmuch as the amount of heaving is attributed to the amount of segregated ice. (Author)

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
THE FLOW LAW FOR ICE, by T. R. Butkovich and J. K. Landauer. Rept. on Mechanics of Plastic Deformation on Ice, Aug 59, 11p. 18 refs. Research rept. 56; AD-235 263.
Order from LC mi$2.40, ph$3.30 PB 149 131

The results of laboratory creep tests in a shear apparatus at ±5°C on 2 x 2 x 3/8 in. samples of commercial ice, artificial single crystals, and 6 types of ice from the Greenland Ice Cap, at shear stresses of about 0.5 - 3 kg/cm^2 are reported. Some uniaxial tests were made at stresses from 6 - 28 kg/cm^2 to supplement the shear tests. Creep data could usually be represented approximately by one or more linear sections on a log-deformation vs log-time plot. The linear sections of the double logarithmic curve imply a creep curve of the form $\epsilon = ct^m$, where ϵ is the strain. For all samples tested, except single crystals sheared in easy glide, m averaged 0.5 for shear deformations up to about 1% and approached unity for more deformation. For single ice crystals oriented for easy glide, m averaged 1.7, implying a strain softening. Single crystals oriented for hard glide behaved similarly to polycrystals, indicating a rate-controlling process such as dislocation climb. For all but single easy-glide crystals, the minimum creep rate was tangent to the deformation curve at the end of the experiment. Creep rates for single easy-glide crystals were several hundred times larger than for the other crystals, the flow laws being similar. (Author)

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
MECHANICAL PROPERTIES OF SINGLE CRYSTALS OF ICE. PART I. GEOMETRY OF DEFORMATION, by Ukichiro Nakaya. Rept. on Thickness and Strength of Ice Surface Layers. Oct 58, 94p. 19 refs. Research rept. 28; AD-216 992.
Order from LC mi$5.40, ph$15.30 PB 147 352

Bending tests were performed on nearly 300 rectangular bars of glacier ice cut from large single crystals (up to 16 in.) at varying orientations, and deformation was studied through measurements of vertical displacement of a median loaded wedge by means of a screw micrometer. The phenomena observed can be explained by assuming that: single crystals of ice have a layer structure stacked in the direction of the optic axis; plasticity is due to gliding between these elementary layers; a small-angle boundary is likely to occur at the point of intense stress concentration and the elementary layer is flexible but not stretchable.

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
ON THE MECHANICAL PROPERTIES OF SEA, ICE THULE, GREENLAND, 1957, by T. R. Butkovich. Aug 59, 27p. 6 refs. Research rept. 54; AD-235 872.
Order from LC mi$2.70, ph$4.80 PB 149 130

The investigations on sea ice, conducted at Thule, Greenland, during February and March 1957 included: unconfined compressive strength, ring tensile strength, and flexural strength tests on simple beams for borth horizontal and vertical test specimens. Additional tests were made to determine the modulus of elasticity with the simple beams in flexure. Tests were also made for creep in uniaxial compression. Although there is a high scatter of results, a dependence of strength and creep on temperature and brine volume is evident. Higher compressive, tensile, and flexural strengths, along with higher values of the elastic modulus were obtained at lower temperatures or brine volumes. The minimum creep rate decreases with decreasing temperature and brine volume. (Author)

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
SEISMIC SURVEY 1957, THULE AREA, GREENLAND, by Hans Roethlisberger. Rept. on Approach Roads, Core Drilling in Permafrost, and Elastic and Visco-Elastic Properties of Snow and Ice. Sep 59, 17p. 10 refs. Technical rept. 64; AD-235 203.
Order from LC mi$2.40, ph$3.30 PB 149 125

Seismic reflection soundings were carried out in the vicinity of Camp TUTO, Thule, Greenland, on the edge of the ice cap. Ice thicknesses ranging from 200 to 800 ft were determined. With a short shot point to geophone distance only sporadic results could be obtained, while with a long distance, up to 3.5 times the ice thickness, very strong reflection signals were recorded. Evidence was found that some of the reflections did not occur at a single clear interface, indicating the presence of alternate layers of moraine and ice at the bottom of the ice cap. At one location, where the result of the seismic sounding could be compared with drilling results, the error was found to be less than 10 ft, the depth at the place being about 200 ft. Later reflection signals on the seismic records are analyzed by means of a master chart. The usefulness of the refraction method was established along the ice tunnel. (Author)

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
SOME STRUCTURAL PROPERTIES OF GREENLAND SNOW, by Alfred Fuchs. Rept. on Structure of Snow and Ice. Dec 59, 28p. 7 refs. Research rept. 42.
Order from LC mi$2.70, ph$4.80 PB 149 129

The results of petrofabric studies in the laboratory on 5 samples of high-density snow collected in 1954 and 1955 at depths of 8.0, 15.5, 23.0, 34.2, and 46.3 m in a pit at Site 2 are reported. The porosity of the samples, the number of grains/sq. cm, the mean number of adjacent grains per grain, the mean grain cross section, the size distribution of grain cross sections, and the orientation of c-axes were determined from enlarged photomicrographs of thin sections, using reflected light and transmitted polarized light. The number of adjacent grains per grain, the ratio of free to occupied grain surface, and the sphericity clearly depended on porosity and on each other. There was no strong relation between these data and the number of grains/sq. cm. Hence, the structure of high-density snow can be satisfactorily described by the porosity and the number of grains/sq cm. Conclusions from a two-dimensional thin section can be applied to a spatial sample only if the sample is isotropic by strata. (Author)

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
STRENGTH DATA ON LAKE ICE, by Guenther E. Frankenstein. Rept. on Bearing Capacity of Floating Ice Sheets. Dec 59, 24p. Technical rept. 59.
Order from LC mi$2.70, ph$4.80 PB 149 124

The results of in-place cantilever beam tests and small-beam tests with center loading, conducted in 1956-57 on lake ice in Minnesota, Wisconsin, and Michigan, are reported; the testing procedures and equipment used are described; and the data are tabulated and graphed. The tests were made on clear ice, snow-ice (dense, medium, and rough), and a combination of clear ice and snow-ice.

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
VISCO-ELASTIC PROPERTIES OF PROCESSED SNOW, by Ukichiro Nakaya. Rept. on Elastic and Visco-Elastic Properties of Snow and Ice. Sep 59, 26p. 6 refs. Research rept. 58; AD-235 329.
Order from LC mi$2.70, ph$4.80 PB 149 133

The results of investigations at Site 2 (Greenland) on rectangular samples of Peter snow (2 x 20 x 1.0 - 1.6 cm) of varying ages are reported, and the methods of study are described. Young's modulus was obtained from the frequency of resonance vibration and viscosity from the rate of damping, using a new visco-elastic meter. A simple relation was obtained between Young's modulus and density when the specimens were grouped according to structure, and the results of the experiments were analyzed for each of the groups, taking age as the parameter. Peter snow 2-3 yr old had almost the same modulus of elasticity as snow naturally compacted for 10 yr. The modulus of elasticity vs density curve for new Peter snow was similar to that of naturally compacted snow, except that the absolute value of the modulus of elasticity was smaller for the same density. Young's modulus however, increased with time, and the curve approached that of naturally compacted snow. When the grain-size distribution was heterogeneous, Young's modulus was larger than for naturally compacted snow of the same density. Mechanical vibration immediately after processing effected an increase in snow density, but did not accelerate age hardening. (Author)

Barodynamics, Inc.
EXCAVATIONS IN FROZEN GROUND. PART II. EXPLOSION TESTS IN FROZEN GLACIAL TILL, FT. CHURCHILL, by C. W. Livingston and Glenn Murphy. Final rept. on Contract DA 11-190-ENG-17. July 59, 43p. 8 refs. SIPRE rept. 30; AD-233 474.
Order from LC mi$3.30, ph$7.80 PB 149 121

Explosion tests were conducted in frozen ground near Fort Churchill, Manitoba, Canada, as an extension of previous tests in Keweenaw silt. Atlas 60 Percent Straight Gelatin Dynamite, Demolition Block M5 Composition C-3, and Atlas Coalite 7S Ammonia-Base Permissible Dynamite were used as the explosives in amounts ranging from 0.5 to 20 lb. Approximately 150 craters were produced. The charges were cylindrical with height-diameter ratios ranging from 0.12 to 9.12, but the majority were in the interval between 2.5 and 4.0. The depths of charges varied, some being quite shallow and others sufficiently deep that no surface effect was observed. In general the results verify scaling laws and show that the critical depth varies as the cube root of the weight of charge. Consistent differences in performance of the explosives were observed. The shape of the charge also influenced the results, but scatter of the data preclude establishing conclusive trends of the influence. (Author) (See also PB 124 727)

Denver U., Colo.
TEMPERATURE DISTRIBUTION OF SNOW WITH GAMMA RAY RADIATION, by Chi Tien. Rept. on Thermal Properties of Snow and Ice. Rept. on Contract DA 11-190-ENG-34. Jan 60, 7p. 2 refs. SIPRE Research rept. 67; AD-237 172.
Order from LC mi$1.80, ph$1.80 PB 149 135

The temperature distribution in snow subjected to gamma radiation from an operating nuclear reactor is analyzed mathematically, assuming that the effect of radiation is equivalent to a continuous heat source, the intensity of which is a function of the radial distance from the reactor. Steady-state solutions are derived for two cases: when the radial distance is 13 ft and when it is 19.1 ft. The results indicate that the temperature of the snow in certain regions in the several feet immediately below the foundation will exceed the design limit of 20F. Increasing the shielding of the reactor will reduce the snow temperature. Other possible ways to reduce the snow temperature include the use of refrigeration coils and the forcing of atmospheric air through the snow. (Author)

Engineer Corps, Washington, D. C.
GREENLAND ICE CAP RESEARCH PROGRAM. STUDIES CONDUCTED IN 1955-1957, VOL. I. June 60, 254p. 7 refs.
Order from LC mi$11.10, ph$39.60 PB 149 194

Contents:
Trafficability of snow, Greenland studies, 1955-1957. AEWES TM-3-414, rept. no. 3. Also available separately as PB 149 196, mi$8.10, ph$27.30.
Glaciological investigations in the Tuto area of Greenland, 1960, SIPRE TR-47.
Snow beams and abutments using Peter snow, 1959. SIPRE TR-55.
(See also PB 146 022)

Geodesy

Aeronautical Chart and Information Center, St. Louis, Mo.
COMPUTATION OF SHORAN DISTANCE. Jan 60 (Revised), 99p. 56 refs. ACIC Technical rept. no. 76, rev., supersedes PB 139 981.
Order from LC mi$5.40, ph$15.30 PB 149 880

This report is concerned with computations of the distances between shoran ground stations and the airborne shoran transmitter receiver. It takes account of such parameters as the height of the aircraft above the earth and the curve of the electronic wave path in the

atmosphere; however, it does not consider other elements of the bombing problem such as ballistic trajectories, wind velocity, etc.

Naval Photographic Interpretation Center, Washington, D. C.
EXPLICIT INTERIOR-EXTERIOR ORIENTATION OF THE CAMERA IN SPACE, by E. L. Merritt.
9 Aug 50, 24p. 1 ref. Rept. no. 121-50.
Order from LC mi$2.70, ph$4.80 PB 149 824

This report released for sale to the public 25 Aug 60.

The purpose of this paper is to describe an explicit solution to the elements of interior and exterior orientation of the camera in space. This solution is presented (1) as an expedient means of obtaining camera data in the field and (2) as a means of partially answering the questions posed above.

Naval Photographic Interpretation Center, Washington, D. C.
EXPLICIT EXTERIOR ORIENTATION OF THE CAMERA IN SPACE, by E. L. Merritt. 20 Apr 51, 12p. 3 refs. Rept. no. 105-51.
Order from LC mi$2.40, ph$3.30 PB 149 826

This report released for sale to the public 25 Aug 60.

Exterior orientation of the camera in space is defined as the determination of the space coordinates (XL, YL, ZL) of the lens and the space orientation (tilt, swing, azimuth) of the camera coordinate system with respect to a geographic coordinate system. The solution described in this paper is an implicit one, in that functions of the elements of exterior orientation are uniquely determined with the given data without recourse to iteration. The explicit functions are then equated directly for the desired unknowns.

Naval Photographic Interpretation Center, Washington, D. C.
EXTERIOR ORIENTATION BY ITERATION, by Everett L. Merritt. 30 May 51, 18p. 13 refs. Rept. no. 117-51.
Order from LC mi$2.40, ph$3.30 PB 149 827

This report released for sale to the public 25 Aug 60.

Two solutions are given in this report; each requires three imaged survey stations in conjunction with certain approximations: (1) One is based on a preliminary determination of the length of the photographic pyramid edges by Finsterwalder's method of iteration. (2) The second is based on a determination of tilt, swing, and altitude by iteration. Initial values are approximated by any means whatsoever.

Naval Photographic Interpretation Center, Washington, D. C.
FOCAL LENGTH DETERMINATION BY VANISHING POINT METHOD ON LOW-OBLIQUE PHOTOGRAPHY, by G. T. McNeil. 15 Aug 49, 5p. Rept. no. 111-49.
Order from LC mi$1.80, ph$1.80 PB 149 823
This report released for sale to the public 25 Aug 60.

The purpose of this report is to determine the approximate focal length of low-altitude low-oblique photography solely by means of vanishing points. No known dimensions are required. A perpendicular system of parallel lines, such as streets and buildings, are required in the photographic perspective to determine two horizontal and one vertical vanishing point. Occasionally, terrestrial and aerial photographs are received whose focal lengths are unknown. This report demonstrates an elementary solution for this special case. (Author)

Naval Photographic Interpretation Center, Washington, D. C.
ITERATIVE DETERMINATION OF THE INTERIOR-EXTERIOR ORIENTATION OF THE CAMERA IN SPACE, by Everett L. Merritt. 29 Aug 51, 15p. 2 refs. Rept. no. 126-51.
Order from LC mi$2.40, ph$3.30 PB 149 829

This report released for sale to the public 25 Aug 60.

See also PB 149 824

Naval Photographic Interpretation Center, Washington, D. C.
LATITUDE DETERMINATION AND CAMERA CALIBRATION WITH STAR EXPOSURES, by Everett L. Merritt. 22 Aug 51, 14p. Rept. no. 125-51.
Order from LC mi$2.40, ph$3.30 PB 149 828

This report released for sale to the public 25 Aug 60.

The purpose of this report is to describe a procedure for determining latitude without chronometer time and calibration data with plane calibration equations from measurements made on star exposure plates.

Naval Photographic Interpretation Center, Washington, D. C.
STAR EXPOSURE METHOD OF CAMERA CALIBRATION, by E. L. Merritt. 15 Nov 50, 51p. 6 refs. Technical Bulletin 131-50, supersedes PIC repts nos. 121-48, 124-48, 104-49 and 105-49.
Order from LC mi$3.60, ph$9.30 PB 149 825

This report released for sale to the public 25 Aug 60.

The purpose of this technical bulletin is to present a method of calibrating cameras from zenithal exposures of stars. The method consists of making exposures of the zenith and calculating the camera constants ($f, \Delta x, \Delta y$) and residual lens distortion, with the plate and celestial coordinates of the stars imaged as given data. The concept of a negative exposure of the zenith for calibrating purposes is illustrated. Reasonable accurate camera calibration data can be calculated because of the multiplicity of star images and the relatively high accuracy of the star's celestial coordinates.

Geography

Coastal Studies Inst., Louisiana State U., Baton Rouge.
PROCESSES OF DELTAIC SEDIMENTATION IN THE LOWER MISSISSIPPI RIVER, by Frank A. Welder. Technical rept. no. 12 on Contract N7onr-35608. 1 July 59, 99p. 69 refs. Contribution no. 59-7; AD-219 944.
Order from LC mi$5.40, ph$15.30 PB 147 181

The Mississippi delta and related alluvial processes are physiographically described and the principles and processes of deltaic sedimentation are analyzed. Physiographically the area consists of active and abandoned river channels, their respective natural levee ridges and inter-levee basins and a limited beach section. The problem was to map and describe these features and to study the processes of nature by which they were created. A restricted area of active deltaic sedimentation was periodically subjected to concentrated field observation. The results make it possible to understand many of the processes associated with the formation of the Mississippi delta, as well as the hydraulic and sedimentary principles involved.

Quartermaster Research and Engineering Center, Natick, Mass.
A QUANTITATIVE SYSTEM FOR CLASSIFYING LANDFORMS, by Walter F. Wood and Joan B. Snell. Feb 60, 24p. 5 refs. Technical rept. EP-124; AD-233 221.
Order from LC mi$2.70, ph$4.80 PB 149 763

A landform classification system based on quantitative terrain data was devised, and tested in a part of Central Europe. Measurements for 6 terrain factors - grain, relief, average elevation, elevation-relief ratio, average slope and slope direction changes - were taken for 413 sample areas within a larger area of over 100,000 square miles. The individual samples were grouped into 25 homogeneous regions in accordance with the similarity of the above measurements. A map of Central Europe delineating these 25 regions was drawn and was found to compare favorably with physiographic maps of the same area drawn solely from qualitative interpretations. The similarity of the quantitatively-described landform regions with those described qualitatively is further proof of the validity of quantitative terrain analysis and demonstrates the usefulness of earlier qualitative geographic work. (Author)

Geology

Armour Research Foundation, Chicago, Ill.
FEASIBILITY STUDY OF A MAGNETIC FIELD SURVEY TO 1 GAMMA, by D. E. Wiegand. Rept. no. 1 (Final) on Contract DA 44-009-eng-1103. 23 Oct 53, declassified 16 May 58, 12p. 7 refs. ARF Proj. no. A 037-1; AD-162 097.
Order from LC mi$2.40, ph$3.30 PB 150 212

This report released for sale to the public 15 Sep 60.

A system for surveying the total magnetic field vector, to a limiting and relative accuracy of 1γ is described. The following points represent the desired goal of a magnetic field survey: (1) contour map of total field strength, (2) contour map of vertical component of field strength, (3) points to be measured and plotted every 6 in. where rate of change of field strength with distance equals or exceeds 2γ per ft or where gradient is less than 2γ per ft points are to be plotted at 1γ spacings, and (4) sensitivity of measurements of 1γ. The detecting device must be an instrument which lends itself to the requirements of field survey work, namely portability, mechanical ruggedness, ease of operation, quick setup time, and detection of field at or close to the earth's surface. The most likely instrument adaptable to the proposed survey is the AN/ASQ-3A magnetic airborne detector. The instrument aligns to and measures the total component of the earth's field. The data would consist of continuous profiles of total magnetic field of fixed length which, when indexed and laid parallel in proper order and spacing, would permit immediate and adequate interpretation for most all investigations. Magnetic anomalies of mines and other objects could be immediately determined by re-surveys.

Pennsylvania State U., University Park.
BIBLIOGRAPHY ON METHODS FOR DETERMINING SOIL MOISTURE, by Mark D. Shaw and William C. Arble. Rept. on Contract DA 36-039-sc-78125. June 59, 153p. 629 refs.
Order from LC mi$7.50, ph$24.30 PB 148 336

This survey of literature consists of references to technical papers and patents relating to soil moisture determination and measurement, with abstracts or brief summaries of their content. No attempt is made to evaluate the work or the methods described. References are grouped under the principal methods of soil moisture determination; chemical, electrical, gravimetric, lysimeter, nuclear, penetrometer, tension, and thermal. (Author)

Oceanography

Air Force Cambridge Research Center, Bedford, Mass.
SCIENTIFIC STUDIES AT FLETCHER'S ICE ISLAND, T-3, 1952-1955, VOLUME III, by Vivian Bushnell. Apr 60, 122p. 169 refs. Geophysical Research Papers no. 63; AFCRC-TR-59-232(3); AD-216 815.
Order from OTS $2.75 PB 161 939

Contents:
Arctic Ice Island and Ice Shelf studies
Seismic studies
Structure and stratigraphy of T-3 and the Ellesmere Ice Shelf
Petrographic evidence on the source area and age of T-3
Macroscopic plant materials
Palynological studies of organic sediments and of coated slides
Airborne viable micro-organism spores collected near sea-level
Detailed descriptions of rock specimens
Details of aeropalynological collection
Details of collecting and processing living micro-organisms
Mollusks collected at the surface of the Ice Island
(See also PB 161 289, PB 161 691)

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
EDGE WAVE MOTION OVER A SHELF, PART I, by R. M. Durstine. Rept. on Contract Nonr-1866(20). June 59, 66p. 7 refs.
Order from LC mi$3.90, ph$10.80 PB 147 258

The purpose of the present paper is to give an analysis of the problem for a hypothetical ocean which has constant depth B out to a certain distance A from the shoreline. Beyond this point, a constant but greater depth L is assumed. Thus the existence of a continental shelf is introduced into the analysis. In reality both the sloping beach and the shelf geometries show characteristics which are observed in the Atlantic Ocean off the coast of North America. The sloping beach is particularly suitable since the wave forms deduced have been shown to decay to a very small fraction for their shoreline magnitude at distances out to sea for which the continental shelf still exists.

Lamont Geological Observatory, Palisades, N. Y.
SOUNDING AND MAGNETOMETER EQUIPMENT FOR A DRIFTING ICE STATION, by A. C. Hubbard and B. Luskin. Technical rept. no. 19 on Contract NObsr-64547. Dec 59, 31p. 3 refs. CU-52-59-NObsr-64547-Geol.
Order from LC mi$3.00, ph$6.30 PB 149 163

The major objectives of the design were compactness in size, weight and power, and simplicity of circuit design and operation. The instruments described here have been in successful and near-continuous operation since July 1959 and provide a good foundation for design of future instruments of this type.

Navy Hydrographic Office, Washington, D. C.
PRELIMINARY REPORT OF SOUTHERN HEMISPHERE OCEANOGRAPHY, by E. C. Stephan. Rept. on Operation Deep Freeze 60 and Chiper Oceanographic-Hydrographic Observations. 25 July 60, 7p. Serial 5159.
Order from LC mi$1.80, ph$1.80 PB 149 531

Two phases of activity were conducted. Phase I was the underway program and consisted of hourly or half-hourly bathythermograph casts, continuous recording of sea surface and shade air temperatures, collection of surface water samples, and sea and swell (or ice) observations. Phase II, accomplished while hove to, consisted of standard oceanographic stations. These included the collection of temperature data and sea water samples at pre-selected depths extending from sea surface to the bottom. Dissolved oxygen analysis and salinity determination were completed on many samples.

Scripps Institution of Oceanography, U. of California [La Jolla].
FINAL REPORT. Rept. for 30 June 51-15 Mar 58 on Contract Nonr-233(04). 28 Oct 59, 31p. 76 refs.
SIO Reference 59-64; AD-230 492.
Order from LC mi$3.00, ph$6.30 PB 149 499

Summaries of papers related to military oceanography of the Pacific.

Woods Hole Oceanographic Institution, Mass.
SOUNDINGS, BOTTOM PROFILES, AND DEEP SCATTERING LAYER OBSERVATIONS: ATLANTIS CRUISE 247, JANUARY-JUNE, 1959 FOR THE INTERNATIONAL GEOPHYSICAL YEAR OF 1957-1958, by Arthur R. Miller. Rept. on Contract Nonr-2196(00). [1959] 126p. Reference no. 60-16; AD-237 816.
Order from LC mi$6.30, ph$19.80 PB 148 126

Results from the Precision Graphic Recorder combined with the Echo Sounder, are presented in this report. These results consist of soundings, both corrected and uncorrected for the speed of sound; bottom profiles, and rough interpretations of the distribution of deep sound scatterers throughout the voyage.

Physics of the Atmosphere

Antenna Lab., Ohio State U. Research Foundation, Columbus.
SURVEY OF THE LITERATURE ON TEMPERATURE DETERMINATION AT ALTITUDES ABOVE 120,000 FEET, by James L. George and William H. Peake. Rept. on Contract DA 36-039-sc-84516. 15 Feb 60, 133p. 230 refs. Rept. 973-1; AD-235 897.
Order from LC mi$6.90, ph$21.30 PB 149 379

The first part of this analysis provides a brief introduction to properties of the atmosphere above 120,000 feet, a discussion of the concept of temperature at high altitudes, and a review of the several methods that have been used or proposed for temperature determination in the upper atmosphere. The second part of the analysis consists of the bibliography proper (each entry containing an abstract), itself divided into thirteen sections. The first five sections are concerned with properties of the upper atmosphere, the sixth with vehicles for research at altitudes above 120,000 feet, and the remainder with the various specific methods for temperature measurement, classified according to the quantity under consideration (e. g., scale height, "rotation" temperature, etc.). (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
BALLISTIC INSTRUMENTATION AND SUMMARY OF INSTRUMENTATION RESULTS FOR THE IGY ROCKET PROJECT AT FORT CHURCHILL, by Harold Zancanata. Jan 60, 74p. 10 refs. Rept. no. 1091; AD-234 338.
Order from LC mi$4.50, ph$12.30 PB 147 790

A total of 82 rockets of various configurations were launched. Of this total, 60 rockets were instrumented with DOVAP and DOVAP telemetering and 5 rockets with ballistic cameras. Ballistic instrumentation performed well. Description of the instrumentation including photographs, discussion of the difficulties encountered and summary of ballistic instrumentation results for all instrumented rockets are given. (Author)

which transmit data and perhaps as many as 5,000 which receive it. However, the proposed system is unlike the old telephone party line in that the transmitting stations get on the line only at the invitation of a master control station which is programmed by operating personnel to call in the stations as required. Receiving stations are programmed, that is to say, "instructed" by operating personnel to monitor the line and automatically cut in to receive desired data from transmitting points in which they are interested. The program at receiving stations may be arranged to select any number of transmissions from the line. This program may also be readily altered by non-technical operating personnel to meet changing data requirements.

Bell Telephone Labs., Inc. [New York].
STUDY OF AIR TRAFFIC IN THE HIGH-DENSITY AREA OF NORTHEASTERN USA AND FORECASTS FOR 1960-65, by J. H. Craig, C. C. Scanlan and others. Interim memo. Task A, pt. 4 on Air Traffic Control Communications, Contract DA 36-039-sc-64567. 31 Dec 56, 53p. 14 refs.
Order from LC mi$3.60, ph$9.30 PB 147 946

An essential element in the design of any communication system is knowledge of the number of subscribers to be served. In the absence of traffic data sufficiently complete for planning effort, work was initiated which has culminated in the preparation of traffic statistics covering a fairly large-sized area. These data cover the traffic for 1955 and are extended into forecasts for 1960 and 1965.

Bureau of [Naval Weapons] Washington, D. C.
A BRIEF DESIGN STUDY OF A GROUND-EFFECT-LIMITED FLIGHT VEHICLE, by H. O. Hollenberg. Aug 57, declassified 8 Apr 60. 20p. 1 ref. Rept. no. DR-1887.
Order from LC mi$2.40, ph$3.30 PB 146 983

Recent experiments by the NACA have shown that a thrust augmentation can be obtained from an annular nozzle in proximity to the ground when compared to a conventional circular nozzle of equal flow area. This principle led to the concept of the ground-effect flight vehicle. This machine flies close to the ground and achieves a large portion of its lift from the sustaining high pressures contained within the annular jet sheet.

Cook Research Labs., Morton Grove, Ill.
PRELIMINARY STUDY OF EMERGENCY LANDING SYSTEMS FOR NON-AUTOROTATING AIRCRAFT AND/OR CREW, by A. H. Solarski and J. A. Fratamico. Final study rept. for June 59-June 60 on Contract DA 44-177-TC-598. 3 June 60, 149p. 12 refs. Rept. P-1890.
Order from LC mi$7.20, ph$22.80 PB 149 441

A preliminary study has been conducted to determine the feasibility of providing emergency landing systems for non-autorotating aircraft and/or crew. Various emergency systems, and techniques are evaluated for their utility in emergency situations peculiar to VTOL aircraft operation. The systems are evaluated with respect to their operational limitations and to the weight penalty imposed on the aircraft. Minimum weight systems are derived in the instance of multiple element systems. Systems qualifying under the above evaluation are further assessed with respect to their utility relative to aircraft type and to material malfunction type. The relative applicability of the qualified systems under the latter considerations is estimated quantitatively. (Author)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
A TEST APPARATUS FOR SMALL ROTORCRAFT. VOLUME I. DEVELOPMENT AND OPERATIONAL CHECK OUT, by Edward M. Sullivan. Rept. on Contract DA 44-177-TC-440. Nov 59, 51p. 2 refs. Rept. no. SG-1195-S-3; AD-235 202.
Order from LC mi$3.60, ph$9.30 PB 148 396

This report describes in detail the design features of a test apparatus that can be utilized to determine the full scale static and dynamic stability characteristics of small rotorcraft. The comparison that is made between the data obtained for a test rotorcraft mounted on the test apparatus and those obtained by NASA for a similar rotorcraft during wind tunnel tests indicates that accurate aerodynamic data can be obtained by the use of the C. A. L. test equipment. (Author) (See also PB 136 564)

David Taylor Model Basin, Washington, D. C.
A PRELIMINARY DESIGN TECHNIQUE FOR ANNULAR-JET GROUND-EFFECT MACHINES (GEM'S), by Harvey R. Chaplin. Sep 59, 15p. Rept. 1371; Aero rept. 966.
Order from LC mi$2.40, ph$3.30 PB 149 822

This report released for sale to the public 26 Aug 60.

Mathematical approach consists of "Mathematical Model" incorporating all of significant descriptive dimensions of vehicle. Provides formulas and curves sufficient to describe vehicle and its hovering performance. In addition, several efficiency factors have been introduced to account for effects to be encountered in operation. Method allows comparisons of different vehicle designs. (Author)

David Taylor Model Basin, Washington, D. C.
SHROUDED PROPELLER THRUST RATIO AS A MEASURE OF SHROUD AND PROPELLER STATIC PERFORMANCE, by Harvey R. Chaplin. Jan 59, 37p. 5 refs. Aero rept. 951; AD-212 203.
Order from LC mi$3.00, ph$6.30 PB 146 588

Formulas for shroud efficiency and propeller efficiency are derived from the one-dimensional momentum theory. These formulas provide a means for approximate evaluation of the static performance of the shroud and propeller individually, in addition to the over-all static performance, from measurements of the total thrust, the propeller thrust and the power input. The formulas are applied to a typical set of experimental data, and are found to provide a quite reasonable interpretation of the experimental results. An extension of the theoretical results to the case of forward flight with axially symmetric flow is presented in an appendix. The one-dimensional momentum theory is still, despite its obvious oversimplifica-

tion of the flow processes, the keystone of our working knowledge of shrouded propellers. It has furnished the commonly accepted definitions of static efficiency (or "figure of merit") and the commonly accepted standards for ideal division of thrust between the shroud and the propeller. (Author)

De Havilland Aircraft Co., Ltd. (Canada).
PRELIMINARY DESIGN STUDIES TO APPLY HIGH FLOTATION ROUGH TERRAIN LANDING GEAR SYSTEM TO THE YAC-1 DH AIRCRAFT. Final rept. Subcontract on Contract DA 44-177-TC-580. July 60, 317p.
Order from LC mi$11.10, ph$48.60 PB 149 209

This report covers the feasibility and preliminary design of high flotation landing gear structure on YAC-1 DH Aircraft for operation under rough field conditions. Considering weight, aerodynamic drag, simplicity, rough field adaptability and necessary changes to existing aircraft structure, the final proposal pointed to a 4 wheel, independent suspended, non-retractable 54" dia. 12 psig tyred main gear mounted to the sides of the fuselage along with a two 35" diam. 10 10 psig tyred nose gear, fixed. Due to lack of advanced information at this time, this scheme presupposes that a suitable tyre rebound damping system is feasible. (Author)

Douglas Aircraft Co., Inc., El Segundo, Calif.
PROGRAMMING OF DIGITAL COMPUTERS FOR DETERMINATION OF STABILITY AND CONTROL CHARACTERISTICS. VOLUMES I AND II, by D. E. Drake, E. R. Keown, and J. R. Matlock. Rept. for 1 July 58-1 July 59 on Contract AF 33(616)5953. 1 July 59, 596p. 2 refs. WADC Technical rept. 59-290, Vol. I and II; AD-228 822.
Order from OTS $7.00 PB 161 924

The analysis of the stability and control characteristics of a flight vehicle configuration is a long, complicated problem. The compilation of the USAF Stability and Control Handbook (M-03671) represents a major contribution to the solution of this problem. The purpose of the research reported is to simplify the necessary computations by replacing the nomograms of M-03671 with numerical tables and procedures and to place the resulting calculation on a large-scale, digital computer. It was found that the graphical techniques of M-03671 lent themselves readily to numerical analysis and no special difficulties were encountered in programming the procedures. The entire calculation for the longitudinal characteristics of a given configuration requires approximately 6 seconds. (Author)

[Douglas Aircraft Co., Inc., El Segundo, Calif.]
PROGRAMMING OF DIGITAL COMPUTERS FOR DETERMINATION OF STABILITY AND CONTROL CHARACTERISTICS. VOLUME III, APPENDIX II, by D. E. Drake, E. R. Keown, and J. R. Matlock. Rept. on Contract AF 33(616)5953. 1 July 59, 417p. WADC Technical rept. 59-290, Vol. III; AD-228 823.
Order from OTS $6.00 PB 161 925

See also PB 161 924

[Douglas Aircraft Co., Inc., El Segundo, Calif.]
PROGRAMMING OF DIGITAL COMPUTERS FOR DETERMINATION OF STABILITY AND CONTROL CHARACTERISTICS. VOLUME IV AND V, APPENDIX III, by D. E. Drake, E. T. Keown, and J. K. Matlock. Rept. on Contract AF 33(616)5953. 1 July 59, 312p. WADC Technical rept. 59-290, Volume IV and V.
Order from OTS $5.00 PB 161 926

See also PB 161 924, PB 161 925

Garbell Research Foundation, San Francisco, Calif.
THE TIMING OF AIRPORT TRAFFIC CONTROL AS INFLUENCED BY WEATHER AND AIRCRAFT PERFORMANCE, by Maurice A. Garbell. Rept. on Contract Cwb-8175. Sep 51, 390p. 86 refs. Garbell Aeronautical Series no. 4.
Order from LC mi$11.10, ph$69.10 PB 147 951

The present study of airport traffic control timing as influenced by weather and aircraft performance was motivated by the established fact that "bad" weather reduces the acceptance rate of a given airport. The immediate objective of the present investigation is to supplement existing intuitive procedures by a substantial method of engineering planning. The first step undertaken was to assess dependably the extent to which meteorological phenomena and aircraft performance affect the timing of air traffic control in a crowded terminal area. A generalized method has been developed whereby meteorological data, both observational and prognostic, can assist effectively in the prediction of airport acceptance rates.

Kellett Aircraft Corp., Willow Grove, Pa.
PRELIMINARY DESIGN OF AN AIRBORNE SUPPORT PLATFORM (ASP). Rept. for 23 June 59-8 Jan 60 on Kellett Model no. K-28, Contract DA 44-177-TC-597. 7 Jan 60, 126p. 16 refs. Rept. no. 173X90-2.
Order from LC mi$6.30, ph$19.80 PB 149 817

Presented in this report are the results of a preliminary design study of a tandem unshrouded rotor aircraft which would satisfy the Army's concept of an aerial jeep; the Kellett version is a more versatile vehicle and is designated as an Airborne Support Platform. Special design considerations, such as low silhouette, narrow operating width, provisions for rotor protective guards, and a vehicle that can be readily transported by the C-130 airplane, are of primary importance. The design study considers the effect of payload (500 lbs. versus 1000 lbs.) on the size, weight and power plant, with particular emphasis placed on the 1000 lb. payload vehicle. The power plant recommended is the T-63-A-3 shaft turbine engine planned for the 1960 - 1963 time period.

Lansdale Tube Co., Pa.
DIFFUSED-BASE R. F. POWER OSCILLATOR JUNCTION TRANSISTORS, by James D. McCotter. Quarterly progress rept. no. 1, 20 June-30 Sep 58, on Contract DA 36-039-sc-78051. [1958] 46p. Philco no. R-220-1.
Order from LC mi$3.30, ph$7.80 PB 149 114

The equipment necessary to fabricate the diffused-base rf power oscillator junction transistor has been assembled, and the fabrication process has been substantially determined. Testing and evaluation of experimental model transistors has shown that an extremely thin base width, and consequently a low collector diode breakdown voltage, is necessary to obtain the electrical characteristics for this device. The suggested specification limits reflect this fact. A mechanized electrolytic clean-up etcher, being developed, should result in a much higher degree of reproducibility and, consequently, a greater yield. (Author)

Naval Air Material Center, Philadelphia, Pa.
THE XEE EXPERIMENTAL ELECTRIC CATAPULT, by J. B. London. 15 Oct 43, declassified 27 Sep 58, 91p. 6 refs. Rept., Part 1 of 2, on TED no. NAM-3404.
Order from LC mi$5.40, ep$16.80 PB 149 613

This report released for sale to the public 11 Aug 60.

Naval Research Lab., Washington, D. C.
STUDIES ON THE FUEL-IGNITION-SUPPRESSION CAPABILITY OF FOAM-COVERED RUNWAYS FOR AIRCRAFT, by H. B. Peterson, E. J. Jablonski, and R. L. Tuve. Final rept. 22 July 60, 68p. 22 refs. NRL rept. 5492.
Order from OTS $1.75 PB 161 783

A comprehensive study has been made of foam-covered runways as a means of suppressing fuel ignition by friction sparks produced by emergency landings of disabled aircraft. The effectiveness of foam as a spark suppressant was found to be dependent on many variables, such as the type of runway construction, the type of aircraft metal, the flammability of fuel, and the depth and age of the foam. Aluminum alloy was found to be the least hazardous of the aircraft metals, since no friction sparks could be produced with this metal. Titanium was the most hazardous aircraft metal tested with respect to fuel ignition by friction sparks, and foam was found to be entirely ineffective as a spark suppressant. Foam spark-suppression effectiveness varied from 57 percent to 100 percent for magnesium alloy, stainless steel, and other aircraft steels tested. Incendive-spark suppression was attributed to the coating effect of the water layer at the runway-foam interface resulting from the continuous drainage of water from the foam mass. Optimum results were obtained with a 2-in. depth of foam (expansion 12, containing 0.1 gal water per square foot) that was evenly laid on the runway surface and that had aged for a 10-15 period. Procedures for properly outfitting existing Navy field equipment (MB-1 and MB-5 crash vehicles) and the material requirements for runway foaming have been established. (Author)

[Pacific] Missile [Range] Point Mugu, Calif.
DEVELOPMENT OF THE KDG-1 AND KD3G-1 TARGET PILOTLESS AIRCRAFT, by W. C. Slowey. Final rept. on Proj. TED MTC PA-604 (formerly TED PAU 1803). 24 June 49, declassified 12 June 56, 39p. 11 refs. Technical rept. no. 51.
Order from LC mi$3.00, ph$6.30 PB 148 629

A total of 66 KD3G-1 and 44 KDG-1 flights were conducted to determine the controllability, maneuverability, stability, rate of climb, maximum air speeds, and endurance of the target P/A. Several modifications that appeared necessary as a result of these tests were incorporated in production versions of the KDG-1 and KD3G-1, which were later designated as the KDG-2 and the KD3G-2, respectively. (Author)

Princeton U., N. J.
THE EFFECT OF CONFIGURATION ON THE LIFT AUGMENTATION RATIO OF A TWO DIMENSIONAL OPEN PLENUM GROUND EFFECT MACHINE, by Dean E. Wright. Rept. on Contract DA 44-177-TC-524. May 60, 133p. 2 refs. Rept. no. 516.
Order from LC mi$6.90, ph$21.30 PB 149 527

This report deals with the base pressure distributions of a two-dimensional open plenum ground effect machine model in simulated hovering flight. The following design parameters were varied, nozzle area/base area, side depth, mass flow, side inclination, and flow diversion. The effect of the variation of these parameters on the pressure distribution, hence lift augmentation was investigated. Flow patterns have been deduced from these distributions and from smoke studies. Also included are a brief theoretical investigation and an investigation into the effect of inclining the model. (Author)

Stanford U., Calif.
ON THE OPTIMUM RESPONSE OF THIRD ORDER CONTACTOR CONTROL SYSTEMS, by I. Flügge-Lotz and Mih Yin. Rept. on Div. of Engineering Mechanics Contract AF 49(638)513. 25 Apr 60, 144p. 13 refs. Technical rept. no. 125; AFOSR-TN-60-476.
Order from LC mi$7.20, ph$22.80 PB 148 921

This investigation is concerned with the optimum response for contactor or relay control systems. The systems are described mathematically by second and third order differential equations with constant coefficients and with a discontinuous forcing term, $\pm$ N. The performance criterion is that the time interval required for the control system to reduce an initial disturbance to zero should be minimum. Significant results toward the solution of the problem have been obtained either intuitively or rigorously by various previous investigators. In the present investigation an attempt toward the optimum solution is made with the aid of the maximum principle for systems with three characteristic roots.

Transistor Applications, Inc., Boston, Mass.
RESEARCH DIRECTED TOWARD THE STUDY, ANALYSIS AND DESIGN OF TRANSISTOR by A. W. Carlson. Scientific rept. no. 3, 1 Nov 59-29 Feb 60, on Contract AF 19(604)4089. Apr 60, 29p. AFCRC-TN-60-395.
Order from LC mi$2.70, ph$4.80 PB 148 556

This report describes work with nonlinear lines having a constant series inductance and voltage dependance shunt capacitance (such as a reverse biased junction diode). Experimentally, it is found that a signal applied to such a line acting to decrease line capacitance has its slope increased as it progresses

down the line. A solution for a wave traveling along a uniform lossless distributed line having a voltage dependent shunt capacitance or a current dependent series inductance is obtained. (Author) (See also PB 145 283)

Westinghouse [Electric Corp., East Pittsburgh, Pa.]
THE ELECTRIC CATAPULT. Rept. on Contract NOas-8114. 15 Dec 44, declassified 27 Sep 58, 41p.
Order from LC mi$3.30, ep$9.30 PB 149 612

This report released for sale to the public 11 Aug 60.

Westinghouse Electric [Corp.] East Pittsburgh, Pa.
ELECTRIC CATAPULT: DESCRIPTION OF APPARATUS, PERFORMANCE, AND STATUS OF PRODUCTION TO DATE. Rept. on Contract NXsa-15165 (NOas-684). 10 May 43, declassified 27 Sep 58, 46p.
Order from LC mi$3.30, ep$9.30 PB 149 614

This report released for sale to the public 11 Aug 60.

Wichita U., Kansas.
SHROUDED PROPELLER INVESTIGATIONS: SHROUD AND CENTERBODY PRESSURE DISTRIBUTIONS OF A SHROUDED PROPELLER WITH A 17-BLADED ROTOR, INLET AND EXIT STATORS AND LONG CHORD SHROUD, by Vernon O. Hoehne. Rept. on Contract Nonr-201(01). Oct 59, 100p. 1 ref. Engineering rept. no. 213-9; AD-230 440.
Order from LC mi$5.40, ph$15.30 PB 149 484

The static pressure distribution on the surface of the shroud and centerbody of a shrouded propeller model was measured in the wind tunnel. The shrouded propeller model embodied 18 adjustable inlet guide vanes, 17 propeller blades, and 19 exit stator vanes; and was equipped with a centerbody or hub having a hub-tip ratio of 0.4. The model incorporated 3 interchangeable shroud inlets: 2 designed for static and low speed operation, and 1 for high speed flight. Pressure distributions were obtained for a range of external advance ratios from approximately 0.20 through 1.50. at angles of attack from zero to 90° and with 3 inlet vane settings. Results are presented as pressure coefficient plotted against model axial location in per cent of chord at various constant values of advance ratio. (Author) (See also PB 140 348)

Wichita U., Kansas.
A METHOD OF DESIGN OF SHROUDED PROPELLERS, by Vernon O. Hoehne and Richard E. Monical. Rept. on Contract Nonr-201(01). Oct 59, 37p. 9 refs. Engineering rept. no. 213-8; AD-228 388.
Order from LC mi$3.00, ph$6.30 PB 149 483

One method of designing shrouded propellers using information derived by several authors was developed and used to design several wind tunnel models. An outline of the resultant design procedure is included along with appropriate discussion pertaining to the method. Results of tests of one of the models designed by these procedures are compared with predicted data to establish, for one case only, the validity of the method. The comparison shows that this system of design predicted performance within the range of normal design accuracy. Predicted efficiency was several percentage points lower than achieved efficiency. (Author)

Chemical Engineering

California Inst. of Tech., Pasadena.
VISCOSITY OF FLUIDS AT HIGH PRESSURES. A ROTATING CYLINDER VISCOMETER AND THE VISCOSITY OF n-PENTANE, by H. H. Reamer, G. Cokelet, and B. H. Sage. Rept. on Project Squid, Contract Nonr-1858(25). Jan 59, 36p. 34 refs. Technical rept. CIT-4-P.
Order from LC mi$3.00, ph$6.30 PB 146 540

A rotating cylinder viscometer suitable for measurements at pressures up to 25,000 pounds per square inch in the temperature interval between 0° and 500°F. is described. Experimental measurements which have been obtained for n-pentane are included as an example of the results to be expected with this instrument. (Author)

Cornell U., Ithaca, N. Y.
AN INTEGRAL PROCESSING UNIT USING A SECONDARY REFRIGERANT, by H. F. Wiegandt. Rept. on Saline Water Conversion by Freezing, Contract 14-01-001-107. Aug 60, 51p. 13 refs. Saline Water Research and Development Progress rept. no. 41.
Order from OTS $1.50 PB 161 906

Large sea water conversion plants which in their operating cycle produce ice with the use of a direct-contact, immiscible refrigerant should ultimately be able to produce potable water with a work-energy requirement of less than 6 Btu per pound of product. The present design for a 10 million gallon per day plant shows a requirement of 11.8 Btu per pound of product with an estimated product cost of $0.38 per thousand gallons. The plant cost is equivalent to $0.67 per daily gallon. An integral unit is projected in which a washing zone serves as a hydraulic seal between the freezing and melting zones. A rapid direct-freezing step, a washing operation in which the ice bed is propelled by a hydraulic piston action, and a melting step in which refrigerant is condensed directly on dumped bulk ice are the major contributions of this work. (Author)

Dow Chemical Co., Midland, Mich.
A STUDY OF VAPORIZABLE EXTINGUISHANTS, by David L. Engibous and Theodore R. Torkelson. Rept. for 1 July 58-Aug 59 on Contract AF 33(616)5838. Jan 60, 124p. 73 refs. WADC Technical rept. 59-463.
Order from OTS $2.75 PB 161 942

Bromochloromethane (CB) is now used as the vaporizing liquid fire extinguishing agent on crash trucks as a supplement to mechanical protein foam, which is the primary means of combatting flammable liquid fires. CB is recognized to present a toxicity problem of ill-defined magnitude. Other agents have been proposed as replacements for CB and this study evaluated the

following compounds for this purpose: Dibromodifluoromethane, Halon 1202; Bromochlorodifluoromethane, Halon 1211; Bromotrifluoromethane, Halon 1301; 1, 2-Dibromotetrafluoroethane, Halon 2402; CB was used as a standard of comparison throughout. A comprehensive survey and analysis of existing literature on these agents which covers effectiveness, toxicity, physical properties, test methods, and dispensing techniques is included. As a result of this study, Bromochlorodifluoromethane (Halon 1211) appears as a promising agent for optimum ground fire protection.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
APPARATUS FOR ZONE REFINING HIGHLY REACTIVE METALS, by G. E. Spangler, M. Herman, and J. L. Rutherford. Rept. on Contract AF 18(600)1581. July 60, 12p. Interim rept. I-A1878-5; AFOSR-TN-60-693.
Order from OTS $0.50 PB 161 929

The development of improved apparatus for the purification of highly reactive metals by the floating zone technique is described. The resultant design consists of a hermetically sealed, all-glass system using a static inert atmosphere which is internally gettered. The apparatus is simple to construct, easy to operate, and provides an absolute minimum of contamination from gaseous impurities. (Author)

Civil Engineering

Arctic Inst. of North America, Washington, D. C.
POLAR HOUSE. Technical rept. on National Science Foundation Grant no. 8987. [1960] 35p.
Order from LC mi$3.00, ph$6.30 PB 148 963

This report covers the planning, development, construction, shipment and erection procedures for the Polar House.

Bureau of Yards and Docks, Washington, D. C.
INSPECTION FOR MAINTENANCE OF PUBLIC WORKS AND PUBLIC UTILITIES. VOLUME 2. INSPECTION GUIDES-ELECTRICAL. 2 June 58, 64p. 16 refs. Technical pub. NAVDOCKS TP-Pw-31; BUDOCKSINST 11014.13A.
Order from OTS $1.50 PB 161 959

Previously announced in USGRR, v. 34, no. 4, 14 Oct 60, as PB 147 652.

See also PB 147 655

Bureau of Yards and Docks, Washington, D. C.
INSPECTION FOR MAINTENANCE OF PUBLIC WORKS AND PUBLIC UTILITIES. VOLUME 3. INSPECTION GUIDES-MECHANICAL. June 58, 78p. 22 refs. Technical pub. NAVDOCKS TP-Pw-31; BUDOCKSINST 11014.13A.
Order from OTS $2.00 PB 161 960

Previously announced in USGRR, v. 34, no. 4, 14 Oct 60, as PB 147 653.

See also PB 161 959

Bureau of Yards and Docks, Washington, D. C.
INSPECTION FOR MAINTENANCE OF PUBLIC WORKS AND PUBLIC UTILITIES. VOLUME 4. INSPECTION GUIDES-STRUCTURAL. June 58, 48p. 16 refs. Technical Pub. NAVDOCKS TP-Pw-31; BUDOCKSINST 11014.13A.
Order from OTS $1.25 PB 161 961

Previously announced in USGRR, v. 34, no. 4, 14 Oct 60, as PB 147 654.

See also PB 161 960

Naval Civil Engineering Lab., Port Hueneme, Calif.
HOLD-DOWN CLAMP FOR 3 x 15 PONTOON CAUSEWAY, by J. V. Stalcup. Final rept. 28 June 60, 21p. Technical rept. 076.
Order from LC mi$2.70, ph$4.80 PB 149 156

Hold down clamps secure causeways to an LST during side carry operations. Ten hold down clamps were tested and all held a greater load then 32,000 lb. BuDocks No. 2, PHIBCB Two No. 1, and NCEL No. 3, appeared comparable on the basis of strength weight, cost, and ease of installation. It is recommended that these three clamps be in-service tested for securing 21-ft wide causeways for side carry. (Author)

Naval Civil Engineering Lab., Port Hueneme, Calif.
NEW AND MODIFIED ANCHORS FOR MOORINGS, by R. C. Towne and J. V. Stalcup. Final rept. 14 Mar 60, 141p. 9 refs. Technical rept. 044.
Order from LC mi$7.20, ph$22.80 PB 149 998

This report released for sale to the public 9 Sep 60.

This report describes the design and development of a family (200 lb, 6,000 lb, 9,000 lb, 12,000 lb) of new mooring anchors which is lightweight, performs efficiently in sand or mud bottoms, and provides a range of holding powers of 6,000 to 10,000 lb. (Author)

Naval Civil Engineering Lab., Port Hueneme, Calif.
WAREHOUSE AND PRESERVATION METHODS AND ECONOMICS FOR STORING MATERIAL, by R. J. Zablodil and J. C. King. Interim rept. 28 June 60, 114p. 9 refs. Technical rept. 075.
Order from LC mi$6.00, ph$18.30 PB 149 233

To evaluate storage and preservation methods, paired equipment is being stored for 5 years in open air, shed and standard, 40% R H and 50% RH warehouses. One of each pair is domestic and the other contact preserved. Results after 2-1/2 years show open air poor, shed fair, standard warehouse good and the RH warehouses best in protective ability. Contract preservation prevents rust better than domestic preservation, and it is cheaper to store non-automotive, metal equipment in the 50% RH warehouse. The test will continue for 2-1/2 more years. (Author)

Aberdeen Proving Ground, Md.
PROCEEDINGS OF THE CONFERENCE ON RELIABILITY AND MAINTENANCE OF ELECTRONIC EQUIPMENT, 4-5 OCTOBER 1955, AT THE ABERDEEN PROVING GROUND, Maryland. [1955] 107p. 3 refs.
Order from LC mi$5.70, ph$16.80 PB 149 200

This report released for sale to the public 31 Aug 60.

Contents:
Are reliability and complexibility incompatible
A practical approach to reliability
Electron tube reliability in antiaircraft fire control equipment at Fort Bliss
Conductance technique as applied to the vacuum tube reliability problem
Reliability through semi-conductors
Component reliability specifications
A reliability test program for electronic equipment
Diagnosis of radar fire control maintenance during World War II and its effect on reliability
Preventive maintenance - keep it simple and effective
Reducing the time required for troubleshooting complex systems
A modern approach to the maintenance support of a guided missile system
Design consideration affecting reliability
Achieving reliability in complex electronic equipment
Sound engineering - the foundation of equipment re-reliability

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
ANALYSIS OF TINKERTOY TECHNIQUES AS APPLIED TO RADAR SET AN/APN-22. Phase rept. on TED Proj. ADC EL-44020. 25 Jan 55, 16p. 2 refs. Rept. no. NADC EL-L5502
Order from LC mi$2.40, ph$3.30 PB 146 966

The Tinkertoy technique, i.e. the Modular Design of Electronics (MDE), is the assembly of electronic equipment by the use of modules which are dimensionally standardized yet have a wide range of electronic applications. A module is a stacked assembly of ceramic wafers imprinted with circuit patterns and bearing miniature electronic parts. The automatic method of manufacturing wafers, processing the imprinted circuits, applying the parts and components, assembling the modules, and performing complete inspections and tests, are referred to as Mechanized Production of Electronics (MPE), but more specifically as the application of Tinkertoy techniques.

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
EVAPORATIVE COOLING OF AIRBORNE ELECTRONIC EQUIPMENT BY SPRAY AND PACKED CHAMBER TECHNIQUES, by Leonard F. Tomko. Phase rept. on TED Proj. ADC EL-9021. 19 Apr 57, 26p. 4 refs. Rept. no. NADC-EL-5712; AD-139 012.
Order from LC mi$2.70, ph$4.80 PB 148 423

An investigation of a spray chamber cooling system and a packed chamber cooling system was made to determine their performance characteristics and to determine whether a theoretical mathematical analysis could be correlated with empirical data. A simulated model of an electronic package was used to gather the data. Air and water flowed countercurrently through a diffusion chamber within the simulated electronic package where the simultaneous heat and mass transfer occurred. A mathematical design technique is described and equations are derived relating the average electronic equipment case temperature to the variables in the simultaneous heat and mass transfer system. The results of the tests showed that a spray chamber cooling system is adequate to maintain case temperatures from 80° to 130° F under the following conditions: (1) airflow and water-flow rates varying from 40 to 100 lb/hr; (2) air temperatures varying from 90° to 260° F; (3) water temperatures varying from 35° to 160° F; (4) an average dewpoint temperature of 52° F for the incoming air; and (5) a 500-watt load at sea level. The packed chamber cooling system is adequate to maintain case temperatures from 116° to 154° F under the following conditions: (1) airflow rates from 40 to 160 lb/hr; (2) water-flow rates from 40 to 106 lb/hr; (3) average air temperature of 109° F; (4) average dewpoint temperature of 55° F; (5)average water temperature of 112° F; and (6) a 1000-watt load at sea level. (Author)

Airborne Instruments Lab., Inc., Mineola, N. Y.
RADIO NAVIGATION AIDS IN COMMON AIR-TRAFFIC CONTROL SYSTEMS, by L. A. Hartman, J. P. Hektner, and A. Tatz. Final engineering rept. on Contract AF 30(602)1444. May 57, 84p. 4 refs. Rept. no. 3580-1; RADC TR-57-132; AD-131 200.
Order from LC mi$4.80, ph$13.80 PB 149 255

Existing and proposed navigation systems were studied to determine their potential usefulness in the common system of air-traffic control (ATC). The system included Decca, Cytac, Tacan, VOR, the Radio-Web system of the French Society of Telecommunications, Doppler navigators, Navatec, and Egecon (electronic geographic coordinate navigation facility). The following conclusions were reached. Increased navigation accuracy is needed for more efficient airspace use to provide safe, efficient, and expeditious aircraft movements in major multiple-airport complexes. For optimum airspace use, the navigation equipment must provide flight paths independent of the lines of position determined by the radio navigation aid. The ATC system should be based on the economic use of facilities commensurate with the requirement in the particular airspace covered. LF hyperbolic systems can provide greater accuracy at a much lower cost for ground installations than the presently planned navigation aids if (1) means can be found to integrate Cytac or Decca into the ATC system, (2) noise interference will not be a serious limitation, and (3) sufficiently lightweight and economic airborne receivers can be built. The ability of an aircraft to fly a prescribed ground-referenced flight path depends on the accuracy of the navigation aid, the aircraft's control characteristics, and knowledge of the rate of displacement from the path. If the latter is supplied by airborne sensors, the information rate from the ground aid can be greatly reduced.

Airborne Instruments Lab., Inc., Mineola, N. Y.
SITE REFLECTIONS ON ILS GLIDE-SLOPE FACILITIES, by A. Tatz. Final engineering rept. on Contract Cca-28688. Oct 53, 94p. 2 refs. Rept. no. 830-2.
Order from LC mi$5.40, ph$15.30 PB 147 954

The ILS glide-slope facilities are considered with respect to the effects of reflecting surfaces in the propagation path. Reflection from terrain is the main feature that determines the quality of system performance. Ground-reflected energy is shown to have variable phase and amplitude, and this variation causes deterioration from ideal performance. Charts are presented to allow calculation of the variable phase and amplitude and of the deterioration of performance. Flight data are submitted to corroborate the extent of deterioration in performance factors. Site criteria are provided to determine the expected performance under various conditions of sites and flight paths. (Author)

Aircom, Inc., Winthrop, Mass.
INVESTIGATION OF HIGHLY DISPERSIVE LOW LOSS TRANSMISSION LINE DEVICES, by R. A. Rivers. Final rept. for 1 Feb 57-30 June 58, on Contract AF 19(604)2136. [1958] 46p. 4 refs. AFCRC-TR-58-155; AD-152 433.
Order from LC mi$3.30, ph$7.80 PB 146 675

A figure of merit is given for comparing dispersive structures for the ratio of dispersion to losses. This figure of merit is employed in comparing several dispersive structures. The figure of merit is related to group velocity and Q. Design data is given for dispersive structures employing periodic loading in ridge guide and in a newly developed ridge trough guide. One structure matched to a 50 ohm input and output has a phase shift of 2.27π between input and output for a 10% frequency shift. This unit has an input VSWR of 1.6 or less over a 10% frequency band and has an insertion loss of 1.8 db or less. (Author)

Applied Physics Lab., U. of Washington, Seattle.
ASTOR RELIABILITY PROGRAM. Rept. on Subcontract NOrd-12937 to Contracts NOrd-17542 and 17647. 1 Aug 58, rev. 1 Feb 60. [1960] 43p. 5 refs. APL/UW/TE/58-25; AD-213 398.
Order from LC mi$3.30, ph$7.80 PB 148 456

Various methods of obtaining circuit reliability are discussed and some methods of computing circuit reliability are shown. A detailed description is given of the Reliability Program. The group organization, and methods of applying reliability concepts to the complete ASTOR program, are discussed. (Author)

Armour Research Foundation, Chicago, Ill.
HIGH POWER TRANSDUCERS, by H. B. Karplus and R. R. Whymark. Quarterly rept. no. 1 on Contract [Nonr]-2900(00). 14 Oct 59, 4p. ARF 1149-1.
Order from LC mi$1.80, ph$1.80 PB 149 877

Several aspects of high power magneto-striction transducer design have not been dealt with adequately in the past. Two of these are the primary concern of this project. One is the loading of the transducer and the other is the utilization of nonlinear parameters.

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
DEVELOPMENT OF PRINTED CABLES AND CONNECTORS, by Wilhelm Angele. 30 June 59, 25p. DG-TR-14-59.
Order from OTS $0.75 PB 161 927

Presented at the 3rd National Convention on Military Electronics in Washington, D. C. Sponsored by the I. R. E., June 30, 1959.

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
PRINTED CABLES AND CONNECTORS. Development rept. no. 3. 18 Feb 60, 95p. Rept. no. DG-TR-4-60.
Order from LC mi$5.40, ph$15.30 PB 149 095

The materials and their features are reviewed and compared with other applicable products. From this comparison conclusions may be drawn as to the advantages of these materials. The product details discussed provide useful information for manufacturers and customers. Mechanical and electrical characteristics of printed cables are outlined and test results are discussed and graphically presented. A complete section of the report establishes requirements for connectors and the necessary application and functional data. Installation, routing, cable end preparation, and fastening techniques are suggested which demonstrate the application and service capabilities of printed cables. Proposals are submitted for printed cable standardization.

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
DESIGN AND DEVELOPMENT OF A PRECISION 400-CYCLE GENERATOR, by Stanley S. Schodowski. 28 Feb 58, 28p. 4 refs. Engineering rept. no. E-1225; AD-160 088.
Order from LC mi$2.70, ph$4.80 PB 149 417

This report describes in detail the design of a 400-cps generator having a high degree of frequency stability and reliability. Considerations given to the choice of resonator, frequency divider and power amplifier are thoroughly treated in connection with meeting all technical requirements. A proven crystal oscillator design procedure is employed in arriving at an optimum design of a highly stable crystal oscillator. Frequency dividers and power amplifiers are designed for maximum performance reliability. Test results are given which indicate the satisfactory performance of the ABMA Precision 400 cps Generator. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PROGRESS IN THE U. S. DURING THE LAST THREE YEARS ON FREQUENCY AND TIME INTERVAL STANDARDS AND MEASUREMENTS, by E. A. Gerber. 20 May 60, 10p. 60 refs. USASRDL Technical rept. 2119.
Order from LC mi$1.80, ph$1.80 PB 149 416

The progress in U. S. during the last three years in the fields of quartz crystal standards, atomic frequency and time standards, and frequency and time measurement and comparison is reviewed. An at-

tempt has been made to describe briefly the most important results of research and development in the above fields, based on the pertinent papers which have been published since May 1957. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
STATIC CAPACITANCE FORMULA FOR A QUARTZ BAR EXCITED IN THE Y'X MODEL OF FLEXURE, by Arthur D. Ballato. 15 Dec 58, 17p. 4 refs. USASRDL Technical rept. 2009; AD-220 105.
Order from LC mi$2.40, ph$3.30 PB 149 414

Quartz oscillators for operating in the Y'X mode of flexure have 2 pairs of electrodes arranged on the major surfaces of the plate, in contrast to most other modes where all the electrodes are parallel. Thus the simple formula for the static capacitance of parallel plates cannot be used. By considering the basic relations between capacitance and energy stored in an electric field, a formula is obtained for the static capacitance, C_o, for the Y'X mode. (Author)

[Army] Signal [Research and Development Lab.] Fort Monmouth, N. J.
TECHNICAL MINUTES OF THE HYDROGEN THYRATRON SYMPOSIUM [NO. 3] HELD AT THE PENTAGON, WASHINGTON, D. C., ON 27-2o MAY 1953, by H. J. Sullivan and M. H. Zinn. 1 Aug 55, 201p.
Order from LC mi$9.30, ph$31.80 PB 149 386

Contents:
Purpose of symposium and general discussion of the results of second symposium
Use of the JAN hydrogen thyratron specification by equipment manufacturers
Design and measurement of hydrogen thyratron modulator characteristics
Thyratron drive requirements and trigger circuits
Miniature tube drivers for high power hydrogen thyratrons
Universal hard tube driver
Use of hydrogen thyratrons as clippers
Effects of driver voltage and source impedance and peak anode charging voltage on pulse time jitter in the 5948 hydrogen thyratron
Arcing behavior in pulsed magnetrons
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Operation of hydrogen thyratrons at conditions other than JAN Test
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System jitter requirements and jitter measuring equipment
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Hydrogen reservoirs in hydrogen thyratrons
The multiple line modulator

Army Signal [Research and Development] Lab., Fort Monmouth, N. J.
TEMPERATURE RISE STUDY, by Abraham Rand. 1 Aug 57, 37p. 1 ref. Engineering rept. no. E-1207.
Order from LC mi$3.00, ph$6.30 PB 147 819

A practical approach is presented for measuring temperature rise rapidly and accurately. It is shown that it is possible to measure temperature rise on an open bench in a varying ambient with better accuracy than present methods in a carefully controlled chamber. The feasibility of eliminating the constant temperature test chamber for most tests is demonstrated. Correlation is of the order of $1^{o}C$ per $40^{o}C$ rise, and repeatability is of the order of a few tenths of a degree centigrade.

Arnold Engineering Development Center, Tullahoma, Tenn.
THE DESIGN AND EVALUATION OF A SIX CHANNEL, D-C COUPLED, TRANSISTORIZED GALVANOMETER DRIVER AMPLIFIER WITH CURRENT LIMITERS, by W. M. Crouch. Rept. on ARO, Inc., Contract AF 40(600)800. June 60, 28p. 3 refs. AEDC-TN-60-96; AD-237 627.
Order from LC mi$2.70, ph$4.80 PB 148 099

A d-c amplifier to drive recording galvanometers and to work in conjunction with analog magnetic tape systems has been designed and fabricated at AEDC. This amplifier has an input impedance compatible with the tape systems, unity or greater voltage gain, very low output impedance, and a frequency response which allow its use with all existing recording galvanometers The unit has built-in current limiters which allow its use with low frequency, low current galvanometers without subjecting the galvanometer to the possibility of being overdriven from random signals or noise. The amplifier was tested for gain, frequency response, drift, phase shift, distortion, common mode rejection, input and output impedance, linearity, output noise level, line voltage interaction, and cross talk. (Author)

Avco-Everett Research Lab., Mass.
AN EXPERIMENTAL MAGNETOHYDRODYNAMIC POWER GENERATOR, by Richard J. Rosa. Rept. on Contract AF 04(647)278. Jan 60, 9p. 3 refs. AMP 42; AFBMD-TN-60-1; AD-233 684.
Order from LC mi$1.80, ph$1.80 PB 147 217

A description is presented of an experimental magnetohydrodynamic generator that was constructed at the Avco-Everett Research Laboratory. Some basic aspects of its performance are summarized. Included is a discussion of the term efficiency as applied to magnetohydrodynamic generators. (Author)

Avco-Everett Research Lab., Mass.
MAGNETOHYDRODYNAMIC ENERGY CONVERSION TECHNIQUES, by Richard J. Rosa and Arthur R. Kantrowitz. Apr 59, 20p. 5 refs. Research rept. 86, formerly Research note 120; AD-233 689.
Order from LC mi$2.40, ph$3.30 PB 147 216

An introductory account is presented of the basic theory of magnetohydrodynamic (MHD) generators, the characteristics of such devices, and the electrical properties of gases. Shock tube experiments which demonstrate some of the fundamentals of MHD flow are described. (Author)

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATIONS OF RHENIUM FOR ELECTRON-TUBE APPLICATIONS, by D. J. Maykuth, G. B. Gaines and others. Final rept. for 1 July 56-31 Mar 60 on Contract AF 19(604)1741. Mar 60, 94p. 40 refs. AFCRC-TR-60-153.
Order from LC mi$5.40, ph$15.30 PB 149 169

The reactions of unalloyed and thoriated rhenium with carbonaceous and boron-containing atmospheres and with Al_2O_3 were investigated. Rhenium is relatively inert to Al_2O_3, is hardened by carbon, and reacts readily with boron trichloride to form brittle borides. Rhenium and rhenium-coated tungsten show excellent resistance to water-cycle attack. While rhenium does not show unusual properties in alkaline-earth cathodes, rhenium matrices containing tungsten and molybdenum show promise for application in pressed-dispenser-type cathodes. The workability to fine wire and properties of molybdenum-, tungsten-, and tantalum-base alloys containing rhenium were studied. Increasing additions of rhenium to molybdenum and tungsten greatly improve the hot workability, hot strength, low-temperature ductility, recrystallization characteristics, and weldability of these metals. Alloys based on Mo-28Re or W-25Re show optimum properties which should make them of interest for use as high-temperature structural and electrode components in electron-tube devices. (Author) (See also PB PB 151 523)

Bell Telephone Labs., Inc. [New York]
IMPROVED ELECTROLYTIC CAPACITORS, by D. A. McLean, N. Schwartz and others. Final rept. for 1 Feb 58-15 Jan 60 on Contract DA 36-039-sc-74996. 15 Jan 60, 48p. 5 refs. Rept. no. 25309-E; AD-232 690.
Order from LC mi$3.30, ph$7.80 PB 149 024

Al, Ti, W, Zr, and Cb were investigated as anodes for solid electrolytic capacitors. Clear interference-colored anodic oxide films can be formed on titanium and tungsten, but both oxides are unstable in either wet or solid capacitors. A rating of 35V at 150°C appears possible for aluminum wire anode capacitors. Thermal treatment and selective etching of the dielectric film yielded improved capacitance, dissipation factor, and leakage for porous anode aluminum capacitors. The initial leakage remains undesirably high but decreases markedly during life test. Zirconium wire anode capacitors were prepared with a tentative rating of 60V at 85°C; similar results with porous anodes were not achieved because purification of the metal does not occur at a sintering temperature 200°C below the melting point. Porous anode niobium capacitors with 6V and 20V ratings have electrical properties comparable to tantalum units, but have the advantage of yielding a higher capacitance-per-anode weight. Although resintered niobium foil can be anodized to 225V, porous pellets start to develop a crystalline film at about 100V. The crystallization is believed responsible for the poor life test stability of 35V rated capacitors. A selective etching process of the oxide film was used to improve the leakages of niobium capacitors. Models were prepared of 6V and 20V rated niobium capacitors. (Author)

Bell Telephone Labs., Inc. [New York]
MICROWAVE SOLID-STATE DEVICES. Interim rept. no. 11, 1 July-30 Sep 59, on Contract DA 36-039-sc-73224. 15 Nov 59, 36p. 11 refs. AD-232 689.
Order from LC mi$3.00, ph$6.30 PB 149 016

Slow-wave structures to be used in traveling wave masers have been studied for a frequency of 2390 mc. Resonance isolators have been operated using yttrium iron garnet at liquid helium temperature and at the magnetic field called for by the ruby maser operation. On the basis of these results, the development of a ruby traveling wave maser for this frequency has been initiated. A theory of high power performance of traveling wave masers has been developed. It suggests a novel utilization of traveling-wave masers as energy storage and conversion elements. Low-temperature noise measurements on a diffused germanium varactor diode have been obtained for amplification in the degenerate mode at a frequency of 6 kmc/sec. Excess noise temperature is determined as a function of the diode operating temperature in the range from near liquid nitrogen temperature to room temperature. Harmonic generation at relatively high-power levels has been achieved using diffused-silicon-junction diodes. The diodes used are "gradual grade" units, in the sense that their impurity gradients are substantially less than those of the silicon varactor diodes, although they are designed to minimize series resistance to ensure maximum cut-off frequency. (Author) (See also PB 144 934)

Bell Telephone Labs., Inc. [New York].
MICROWAVE SOLID-STATE DEVICES. Interim rept. no. 12, 1 Oct-31 Dec 59, on Contract DA 36-039-sc-73224. 15 Jan 60, 29p. AD-235 853.
Order from LC mi$2.70, ph$4.80 PB 149 017

Starting with a four terminal network representation, the impedance transformation from the semiconductor region of a mesa diode to a transmission line is discussed. It is shown that, under certain assumptions, the transformation between measured reflection coefficient and device impedance can be formulated in a simple way, and may be arrived at through a series of operations on a Smith chart. Proper use of impedance standards can determine the transformation. Experiments (conducted at a single frequency only) indicate validity of the assumptions, one of which is the appropriateness of the impedance concept itself. Using these measurement techniques, the impedance of a considerable number of diffused silicon mesa varactor diodes has been evaluated. The experimental results, obtained using diffused silicon from a single run with a fixed impurity gradient, indicate a dependence of Q (measured at 1 kmc per sec.) on the area of the diffused junction. This is attributed to the presence of an equivalent series resistance, some of which must be attributed to losses near the active region of the device. The magnitude of this series component is enough to begin limiting the cut-off frequency obtainable with diffused wafers when the junction capacity sizeably exceeds two or three pf. Possible reasons for these losses are discussed. (Author) (See also PB 149 016)

Bell Telephone Labs., Inc. [New York].
NIKE B TRACKING RADAR SERVOS. CASE 27675-2, by J. E. Tarr. Memo. for file. 2 Dec 55, 6p.
Order from LC mi$1.80, ph$1.80 PB 150 145

This report released for sale to the public 13 Sep 60.

Bell Telephone Labs., Inc., [Whippany, N. J.]
STUDY OF SOLDERLESS WRAPPED CONNECTIONS FOR MILITARY COMMUNICATION EQUIPMENTS, by S. J. Elliott. Final rept. on Task BN; Technical rept. no. 15 on Engineering Services on Task Studies of Military Communication Systems, Contract DA 36-039-sc-52593. 21 June 56, 50p. AD-133 953.
Order from LC mi$3.30, ph$7.80 PB 147 920

Pertinent information, accumulated during the development of solderless wrapped connections for Bell System use, is reviewed in this report. The solderless wrapped connection is described, its advantages and disadvantages are enumerated, and parameters that influence its reliability are discussed. Solderless wrapped connections have a reasonable prospect of performing reliably in military communication equipments. Additional tests should be made, however, to evaluate their reliability under the environmental conditions of military service. Solderless wrapping would be advantageous in the manufacture of military communication equipments, provided the equipments are designed for solderless wrapping. Guidance for design is included. The problem of changing connections (where insufficient slack is available in an existing lead) would limit the usefulness of solderless wrapping for maintenance. This limitation, however, would not preclude the use of solderless wrapping in manufacture. (Author)

Bendix Aviation Corp., Eatontown, N. J.
Ge PNP DRIFT BASE POWER TRANSISTOR, by Charles Z. Leinkram, H. Newman, and W. C. Waldron. Final rept. no. 4, 15 July 58-15 Dec 59, on Transistors, Power, Drift Base, Germanium PNP, Contract DA 36-039-sc-78149. [1959] 113p. AD-235 673.
Order from LC mi$6.00, ph$18.30 PB 149 117

The production refinement program is presented for the 2N1430 drift base power transistor. This device is characterized by very fast switching times at high collector currents, high-frequency response, low saturation resistance, and excellent high temperature stability. The refinement of development techniques so that production of the drift base power transistor could be readily achieved required the optimum employment of conventional transistor technology and the use of new and imaginative fabrication methods. The resulting processes not only yielded production techniques capable of low cost manufacture of the unit but also gave a greater understanding of the technology of the devices. The introduction of new concepts in diffusion and slice preparation, and the use of special emitter alloys resulted in better yields, greater reliability and better performance of the transistor. Testing and evaluation of the product has continued beyond completion of the contract requirements. The results of this further evaluation indicates a greater device capability than called for in the contract specifications. Some parameter measurements of a higher current transistor, B1037B, are included. (Author)

Case Inst. of Tech., Cleveland, Ohio.
SHUNT SUSCEPTANCE OF PLANAR ARRAYS OF CONDUCTING DISCS, by Ronald A. Gardner. Master's thesis. Scientific rept. no. 13 on Contract AF 19(604)3887. 25 Apr 60, 71p. 8 refs. AFCRC-TN-60-533 (or 553).
Order from LC mi$4.50, ph$12.30 PB 148 745

The value of shunt susceptance is computed for a planar array of conducting discs using small aperture theory. Static and dynamic interaction effects are considered. Computed values of shunt susceptance are compared with experimental values. Using experimental values of shunt susceptance, a propagation constant is determined for disc type artificial dielectric. (Author)

Case Inst. of Tech., Cleveland Ohio.
A TRANSISTOR REGULATED POWER SUPPLY FOR A HIGH CURRENT MAGNET, by Kenneth C. Brog. Master's thesis. Technical rept. no. 2 on Contract Nonr-1141(07). Aug 59, 42p. 9 refs. AD-229 365.
Order from LC mi$3.00, ph$6.30 PB 148 179

Current regulation of a high current electromagnet utilizing power transistors in series was achieved. A sampling voltage, obtained from a sensing resistor in series with the magnet, is compared with a reference voltage; the error signal is sufficiently amplified and fed back to the series transistors thru a 2 stage transistor driver. Magnetic fields from 845 gauss to 8550 gauss with field regulation of a few parts per million over this range were obtained. (Author)

[Centre de Physique, Eléctronique et Corpusculaire (France)]
DESIGN AND DEVELOPMENT OF UHF PROTOTYPE CARCINOTRON TUBES WITH MAGNETS. Final rept. on Contract AF 61(514)917. Dec 57, 113p. 1 ref. WR.204; RADC TR-58-62; AD-148 714.
Order from LC mi$6.00, ph$18.30 PB 147 808

Development was conducted on 2 UHF prototype carcinotron tubes with magnets to cover the 200- to 400-mc band. Design requirements called for a minimum HF output power of 5 kw. The 2 tubes are the CM 32 covering the 200- to 300-mc band the the CM 34 covering the 300- to 400-mc band. A convenient interdigital line was chosen to deliver the wanted RF power in the given tuning range. Main disadvantages of the tubes are the large dimensions. These dimensions can be reduced with a short finger line and the CM 34 will be designed with a finger length of 140 mm and the CM 32 with a finger length of 200 mm. The RF properties, especially the dispersion characteristics and matching problem of the line and output device, were examined. The main difficulty experienced was the rather close-by cutoff of the line. The design of the sole and collector is given, and only a very closely shielded collector suppressed parasitic plate current. Means were tried for improving the heat transfer between the absorbing layer and the cooling medium. The most satisfactory device for heat transfer is a glass tube with Kovar contacts covered by an inner aquadag layer protected by Araldite. To avoid heat transfer between 2 faces of an insulator, the cooling liquid is made a conductory (salt water with a concentration of 30 to 40 g/liter is satisfactory).

Centre de Physique Electronique et Corpusculaire (France).
WIDE DYNAMIC RANGE BARRIER GRID STORAGE TUBE T. C. M. 16, by G. Wendt. Quarterly rept. no. 1 on Contract N-62558-2275. 1 Sep 59, 22p. W. R. 434
Order from LC mi$2.70, ph$4.80 PB 148 868

Several tubes were mounted with guns which were described previously: their characteristic curves showed up a beam current to collector plus aperture current ratio which was satisfactorily constant. The target behavior inside the tube with the new gun was studied. Various abnormal effects appear on that tube and this new coplanar effect has not been explained. (See also PB 146 261)

Centre de Physique Electronique et Corpusculaire (France).
WIDE DYNAMIC RANGE BARRIER GRID STORAGE TUBE T. C. M. 14, by G. Wendt. Final rept. for May 57-Jan 59 on Contracts N62558-(14)-1667 and N62558-(14)-1932. 31 Oct 59, 178p. 2 refs. W. R. 457; AD-228 840.
Order from LC mi$8.10, ph$27.30 PB 149 876

Contents:
How to improve the output signal amplitude and the charge and discharge factors
- Conventional theory of charge deposition and withdrawing on the dielectric surface of a tube T. C. M. 14
- Main parameters (I_W, I_R, τ, σ_A, C, Δt) influence on the reading signal amplitude according to the way the tube is used
- Measurement of the target main electronic properties
- Tentative explanations of the anomalies observed during the tube measurements

Improvement of the resolution
- Methods for measuring the resolution
- Improvement of resolution at the target center shielded collector given up
- Improvement of the resolution at the target edges
- Some disturbing effects

Output signal irregularities
- Definition of the various signal irregularities
- Low frequency irregularities
- High frequency irregularities

Target technology
- Conventional targets
- Targets having embedded barrier grids
- Thick dielectric targets

Characteristics of the final tube T. C. M. 14
- Static operating data
- Dynamic data

(See also PB 146 261)

Chatham Electronics, Livingston, N. J.
IMPROVED BALLAST TUBE FILAMENT MATERIALS, by R. Spencer and W. Buchanan. Final rept. for 15 July 58-14 Oct 59 on Contract DA 36-039-sc-78158. [1959] 75p. 4 refs. AD-234 904.
Order from LC mi$4.50, ph$12.30 PB 149 025

Comparison information is presented in the data and in the graphs for various types of iron filaments operated in hydrogen, helium, neon, argon, and xenon. The tube life test data was obtained by running the filaments on various continuous and intermittent operation. The results indicate that most promising filament type is the gold-platinum plated iron filaments operating in 100% helium. No burnouts or changes in current out of prescribed limits have been observed for this filament type in over 5000 hours of life test operation. (Author)

Clevite Corp., Cleveland, Ohio.
RESEARCH ON NEW HIGH TEMPERATURE SEMICONDUCTING MATERIALS, by Shaun S. Devlin, Jacob M. Jost, and Lebo R. Shiozawa. Rept. on Contract AF 33(616)3923. June 60, 167p. 87 refs. WADD Technical rept. 60-11.
Order from OTS $3.00 PB 161 938

Three years of research on the preparation, purification, crystal growth, and measurement of the fundamental properties of CdS, CdSe, ZnTe, and mixed crystals of CdS·CdSe are summarized. The basic requirements of high-temperature semiconductor devices for operations to 500°C were closely examined and led to the choice of the above materials for further investigation. A detailed account, with liberal references to previous quarterly reports, is presented on the following topics; (1) purification of elemental zinc, cadmium and tellurium by zone refining and vacuum distillation using spectrographic and radioisotopic techniques for evaluation; (2) mechanism of crystal growth in the Reynolds-Czyzak process, including analog studies of soap-bubble and iodine-crystal models; (3) measurement of basic properties. Measurements taken of a variety of doped and undoped crystals include; (1) X-ray crystallographic data; (2) thermal expansion data from 25 to 200°C; (3) optical absorption (energy gap) data, including the variation of ΔE with composition of mixed CdS-CdSe crystals; and (4) data on the temperature dependence of Hall effect and conductivity from 77°K to 800°K. The room-temperature energy gaps are typical values of interest and for CdS, CdSe, ZnTe and ZnSe are 2.38, 1.70, 2.21 and 2.43 ev, respectively. ΔE of mixed crystals are nonlinear with composition (ΔE of $Cd(S_{.5}Se_{.5})$ - 1.91 ev). Room temperature carrier mobilities in doped crystals ($P \simeq 10^{-2}$ to 1 ohm cm) are 350, 550, and 100 cm^2/volt sec., respectively, for CdS(n-type), CdSe(n-type), and ZnTe (p-type). At high temperatures $\mu_n \propto T^{-3/2}$ for In-doped CdS, $\mu_n \propto T^{-1}$ for Ga-doped CdSe, and $\mu_p \propto T^{-3/2}$ for Cu-doped ZnTe. Low temperature electron mobility in Ga-doped CdSe $\simeq$ 1000 cm^2/volt sec. with $n \simeq 10^{17}$ cm^{-3}. Thermoelectric power of Ga-doped CdSe = 250 μV/°K. (Author)

Compagnie Générale de Télégraphie Sans Fil (France)
INFLUENCE OF THE MANUFACTURING PRECISION OF AN ANTENNA ON ITS PERFORMANCE, by J. Robieux. Technical note no. 1 on Contract AF 61(514)737. C. 27 May 55, 80p. (p. 65-66 omitted). AD-83 556.
Order from LC mi$4.50, ph$12.30 PB 150 090

The purpose of the present study is to investigate the influence of manufacturing lack of precision on the performance of an antenna. The problem is stated in the introduction. The field radiated by an antenna results from the addition of the fields radiated by each one of its elements. A lack of precision in man-

ufacturing does not modify in any substantial manner the amplitudes of these elemental fields. It is necessary, however, to add to their theoretical phases, calculated by utilizing the surface, assumed perfect, an aleatory angle which corresponds to the aleatory deviation between the actual surface the the theoretical surface. The problem is thus an aleatory problem and it is necessary to use the methods of the calculus of probabilities.

Computation Lab., Harvard U., Cambridge, Mass.
SOME APPLICATIONS OF LOGICAL SYNTAX TO DIGITAL COMPUTER PROGRAMMING, by Richard Manning Carp. Doctoral thesis. Rept. on Theory of Switching to Bell Telephone Labs. Jan 59, 200p. 54 refs. Rept. no. BL-22.
Order from LC mi$8.70, ph$30.30 PB 147 350

In this thesis the methods of logical syntax are applied to the analysis of programming languages. The programming languages considered include not only computer languages, but also flowcharting languages and the source languages of automatic programming systems. Syntactic models are defined and used for the development of analytic check-out procedures and techniques for improving the efficiency of programs. (See also PB 147 351)

Computation Lab., Harvard U., Cambridge, Mass.
THEORY OF SWITCHING, by Howard Aiken. Rept. for 1 May 56-Dec 56 to Bell Telephone Labs. [1956] 193p. 64 refs. Rept. no. BL-16
Order from LC mi$8.70, ph$30.30 PB 147 348

Contents:
The synthesis of a special class of switching functions
Silicon carbide crystal switches
The decomposition of switching functions
A theorem concerning two-terminal switching networks
On the functional separability of Boolean functions
Recording on thin magnetic films with a single wire polepiece, preliminary report
A mathematical model for single wire recording
Circuit synthesis for network switching functions (II)
(See also PB 122 821)

Computation Lab., Harvard U., Cambridge, Mass.
THEORY OF SWITCHING, by Howard Aiken. Rept. to Bell Telephone Labs. 15 Dec 58, 173p. 19 refs. Rept. no. BL-21.
Order from LC mi$8.10, ph$27.30 PB 147 351

Contents:
The use of adding transformations in the synthesis of switching functions
Notes on the subfunctions of switching functions
Identification and optimal realization of a class of switching functions
Transportation problems with joint capacity constraints
Refined methods of solving the traveling-salesman problem
Magnetic core parallel adder
(See also PB 140 104)

Computation Lab., Harvard U., Cambridge, Mass.
THEORY OF SWITCHING, by Howard Aiken. Rept. to Bell Telephone Labs. 1 June 59, 138p. 14 refs. Rept. no. BL-23
Order from LC mi$6.90, ph$21.30 PB 147 349

Contents:
Modular functions
Transportation problems with equality constraints
The description of finite sequential processes
A Harvard Univac method for the selection of the prime implicants of a switching function
The derivation of minimal forms for incompletely defined switching functions
(See also PB 147 350)

Control Systems Lab., U. of Illinois, Urbana.
BARRIER GRID STORAGE TUBE DISTURBANCE, by John K. Robe. Rept. on Contract DA 36-039-sc-56695. Aug 58, 37p. 3 refs. Rept. no. R-103; AD-202 487.
Order from LC mi$3.00, ph$6.30 PB 149 400

Storage tube disturbance is defined as the positional fluctuations of the input-output characteristic. An attempt to characterize this single concept by a single number or "Figure of Merit" is complicated by the fact that disturbance has been found to be a function of several variables. The periodic and aperiodic structure of the barrier grid of a barrier grid storage tube is used to illustrate disturbance. It is found that a portion of the disturbance is independent of the signal level, whereas another portion is directly dependent on it. In considering the frequency distribution of the disturbance it is found that the aperiodic variations cause a disturbance which is spread throughout the tube's pass band, while the periodic variations produce a disturbance at particular frequencies. The amplitude of the periodic disturbance which appears in the output is shown to be a function of the ratio of beam diameter to barrier grid mesh size. (Author)

Cruft Lab., Harvard U., Cambridge, Mass.
A LOOP ANTENNA COUPLED ELECTROMAGNETICALLY TO A FOUR-WIRE TRANSMISSION LINE TO ACHIEVE THE CIRCULARLY POLARIZED RADIATION, by Kun-Mu Chen. Scientific rept. no. 5, series 2, on Contract AF 19(604)4118. 25 Jan 60, 67p. 3 refs. AFCRC-TN-60-365; AD-237 668.
Order from LC mi$3.90, ph$10.80 PB 148 321

A loop antenna coupled electromagnetically to a four-wire transmission line is studied theoretically and experimentally when the line is driven as two mutually perpendicular two-wire lines that are 90^{o} out of phase in time. The size of the loop at which resonance occurs is determined. The zeroth-order and first-order solutions of the current distribution are evaluated and it is found that at resonance the antenna currents due to each two-wire line oscillate in a dipole mode of the loop. The currents induced by the four-wire line circulate as a traveling wave. The radiation fields pattern is also evaluated. The square loop is first studied; later, it is shown that the circular loop resembles the square loop closely. An array that consists of many loop antennas coupled electromagnetically to a four-wire transmission line has a very high gain with circularly polarized radiation. (Author)

Cruft Lab., Harvard U., Cambridge, Mass.
THE RADIATION PATTERNS PRODUCED BY A LINEAR ARRAY OF HALF-WAVE DIPOLES COUPLED ELECTROMAGNETICALLY TO A TWO-WIRE TRANSMISSION LINE, by Dipak L. Sengupta. Scientific rept. no. 4, series 2, on Contract AF 19(604)4118. 20 Jan 60, 21p. 6 refs. AFCRC-TN-60-371; AD-237 669.
Order from LC mi$2.70, ph$4.80 PB 148 322

The effects of the different physical parameters on the radiation pattern are studied both from physical and theoretical considerations. The theoretical conclusions are verified by actual measurements. The electromagnetic coupling principle used in this antenna provides more flexibility for controlling the radiation pattern than in the case of the usual method of coupling the dipole arrays to a two-wire transmission line. A step-by-step design procedure is given; this can be used in order to obtain the best radiation pattern from the antenna. (Author)

David Sarnoff Research Center, Princeton, N. J.
STORAGE LIGHT INTENSIFIER DISPLAY PANEL, by E. E. Loebner, H. O. Hook, and D. C. Darling. Quarterly rept. no. 6, 1 July-30 Sep 57, on Contract DA 36-039-sc-71194. 15 Oct 57, 30p. 3 refs. AD-151 525.
Order from LC mi$2.70, ph$4.80 PB 149 366

Progress is reported for work accomplished on following: (1) complex circuit optical feedback light intensifiers for feedback control and multitone storage, (2) design, fabrication and test of perforated and pedestal photoduct and lateral flow structure light intensifier panels, (3) fabrication techniques of interlayer conductor patterns and master patterns for test structures, (4) device analysis of light intensifiers including photoconductivity, electroluminescence and photoduct transmission, (5) simulated device tests, and (6) the adaptation of a logarithmic preamplifier for use with photomultiplier. (Author)

Diamond Antenna and Microwave Corp., Wakefield, Mass.
RADIO FREQUENCY ROTARY COUPLER CU-64[MSQ-16(XW-1) by Robert W. Silberberg. Rept. no. 2 on Contract AF 30(602)1931. 20 Dec 59, 21p. 5 refs. RADC TN-59-42; AD-210 394.
Order from LC mi$2.70, ph$4.80 PB 147 361

This report describes the efforts and work accomplished during the second quarter period of the subject contract for the development of a Four Channel Rotary joint. Two channels will transmit signals in the frequency range of 1-4 Kmc, and the other two channels cover the range of 4-15 Kmc. The VSWR will be limited to less than 1.8 to 1, and its variation as a function of rotation shall be less than 1.1 to 1. The portion of the task reported here includes the test results of the prototype 1-4 Kmc channel, #3, and the 4-15 Kmc channel, #1. Some results of a theoretical investigation are presented together with the suggested modifications. It is shown that the channel #1 unit is satisfactory in its present form, however some improvement is expected following subsequent changes. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
A NOTE ON ZERO-CROSSINGS AND AVERAGE FREQUENCY, by P. R. Karr. 25 Oct 54, 10p. 3 refs. Technical rept. TR-133.
Order from LC mi$1.80, ph$1.80 PB 149 329

An expression is derived for the expected rate n of zero crossings of the function $\sin[N(t) + \gamma)$, where N(t) is a stationary, Gaussianly distributed, random or "noise" function with zero mean.

Diamond Ordnance Fuze Labs., Washington, D. C.
TRANSISTOR D-C REGULATORS, by F. Allen and H. J. Reed. 18 July 60, 19p. 8 refs. Technical rept. TR-852.
Order from LC mi$2.40, ph$3.30 PB 148 224

Modifications and extensions of a basic series-type regulator circuit are utilized in the design of three d-c regulators for electrochemical power supplies. Expressions are given for the regulated output voltage and the output resistance in terms of the supply voltage and circuit parameters. The performance of the experimental circuits is in reasonable agreement with the calculated values obtained from the stability equations. (Author)

Eastman Kodak Co., Rochester, N. Y.
BASIC RESEARCH INVESTIGATIONS FOR AMMONIA VAPOR ACTIVATED BATTERIES, by J. M. Freund, V. M. Bryant, Jr. and J. B. Schliff. Final rept. for 15 Sep 57-14 Sep 59 on Contract DA 36-039-sc-74902. [1959] 63p. 10 refs. AD-235 814.
Order from LC mi$3.90, ph$10.80 PB 149 109

The densities of several ammonium salts, KSCN, and $Pb(NO_3)_2$ together with mixtures of the last with NH_4NO_3 have been measured, mostly at -34°C. With the exception of KSCN, these solutions are non-ideal. Conductance of the same substances has also been measured. The KSCN solutions have the highest specific conductance at the optimum concentration. At the maximum, NH_4SCN is a better conductor than is NH_4NO_3. In highly concentrated solutions, however, NH_4NO_3 is the better conductor. KSCN at its peak is a 30% better conductor at -60°C. and a 20% better conductor at -40°C. than NH_4SCN. Studies of liquid $Zn/NH_4SCN/PbO_2$ cells at -40°C. show that essentially 100% of theoretical cathode capacity was obtained at current densities up to 31 ma/cm^2, although there were less than 4 moles NH_4SCN per mole PbO_2 available in the electrolyte. Liquid $Pb/NH_4SCN/PbO_2$ cells, discharged at current densities between 0.15 and 15 ma/cm^2, delivered the theoretical capacity of the PbO_2. Vapor activated $Pb/NH_4NO_3/PbO_2$ cells, discharged at room ambient temperature, show susceptibility to concentration polarization as the ammonium ion available is decreased. (Author) (See also PB 145 878)

Edison, Thomas A., Industries, West Orange, N. J.
HIGH CAPACITY VENTED NICKEL-CADMIUM CELLS, by Arthur Fleischer, Edward C. Kopper and others. Quarterly rept. no. 1, 30 Nov 59-29 Feb 60, on Contract DA 36-039-sc-84555. [1960] 59p. 20 refs.
Order from LC mi$3.60, ph$9.30 PB 149 118

The task of manufacturing six types of high capacity nickel-cadmium cells varying in capacity from 3.5 to 36 amp-hrs. was set up in three phases, experimental design, and manufacture. The experimental program for the Type 4 cell was set up after a preliminary estimate of elements for the six sizes of cells. A sufficient number of cells was planned to permit testing two concentrations of lithium hydroxide in the 30% potassium hydroxide electrolyte. In addition, cells were included to study the effect of a 5% cobalt addition to the fused nickel nitrate impregnating bath in the Edison process for preparing positive plates. The design of cells, cell parts and hardware, and tools and fixtures has proceeded up to the point at which further progress must be delayed till decisions can be reached on the basis of the experimental program.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
RATIONAL APPROXIMATION OF ARBITRARY REAL FUNCTIONS WITH SPECIFIED WEIGHTS, by Tao-Nan Tang. Doctoral thesis. Technical note. no. 14 on Contract AF 49(638)63. 1 May 60, 99p. 25 refs. AFOSR-TN-60-613.
Order from LC mi$5.40, ph$15.30 PB 148 766

The problem of obtaining the Tchebysheff approximation of a real continuous function in a closed interval by a polynomial or a rational function under a specified weighting function is treated. Solutions of such problems are obtained by numerical methods involving iterative procedures which may be carried out by modern computing machines. The effect of shifting a zero or several zeros of an error function on the weighted error function itself is obtained by multiplying the amount of shift by the sensitivity, defined as the partial derivative of the weighted error function with respect to the zero shifted. The successive equalization of the weighted error function at the points of extrema gives an iterative procedure with assured convergence of the process.

Electro-Optical Systems, Inc., Pasadena, Calif.
DESIGN AND DEVELOPMENT OF VERY HIGH SPEED SWITCHING TECHNIQUES, by R. M. Aron, M. P. Ernstene, and F. R. Marshall. Final technical rept. on Contract DA 04-495-501-ORD-1097. 15 May 59, 76p. 12 refs. Rept. no. 120-Final; AD-218 844.
Order from LC mi$4.50, ph$12.30 PB 147 609

The hydrogen thyratron and the atmospheric triggered spark gap were studied. With the hydrogen thyratron used in the normal circuit configuration, current commutation times as low as 4.5 millimicroseconds were achieved, and times as brief as two millicroseconds are believed possible by making use of design improvements demonstrated to be advantageous. With the hydrogen thyratron in a special pulsed-anode circuit configuration, a current commutation time of two millimicroseconds was achieved, and fractional millimicrosecond times appear to be obtainable. With the triggered spark gaps at atmospheric pressure, current commutation times as brief as 7 millimicroseconds were achieved. The operation of the high pressure triggered spark gaps follows simple scaling laws which show that commutation times can be expected to vary inversely with pressure, up to pressures of 10 to 20 atmospheres; hence commutation times under a millimicrosecond are possible. (Author)

Electronic Defense Labs., Sylvania Electronic Systems, Mountain View, Calif.
OPTIMAL SPARES PROVISIONING FOR ELECTRONIC SYSTEMS, by Jorgen P. Jorgensen. Rept. on Contract DA 36-039-sc-78281. 30 Mar 60, 91p. 13 refs. Technical memo. no. EDL-M237; AD-235 936.
Order from LC mi$5.40, ph$15.30 PB 148 340

Spare parts kits were designed for the AN/MLQ-19 (XL-2), ESGM I, and EP-EDL-16 systems. The kits provide spares for a one-year operating period at an assurance level of 0.85 to 0.90.

Electronic Engineering Co., of California, Santa Ana.
MODIFICATION OF FIRE CONTROL SYSTEM, AA, M-33, by R. F. Akers. Final technical rept. for 1 May-5 Nov 59 on Contract DA 36-039-sc-78317. 15 Dec 59, 21p.
Order from LC mi$2.70, ph$4.80 PB 149 377

The primary modification involved the installation of a system to provide high accuracy digital data. This involved: installation of precision encoders on the azimuth, elevation, and range shafts of the radar; addition of slip rings to accommodate the encoder data: and design, fabrication, and installation of electronic equipment to provide the precision digital data output. Other modifications involved: the addition of a sighting telescope on the antenna; the design, fabrication, and installation of a remote control unit so that an operator at the antenna can position the antenna; and changes to the plotting board to provide for various map scales. The accuracy tests performed on the high-precision data system are included, and reveal that linearity errors in azimuth and elevation were less than 20 seconds of arc. Backlash and range data errors were too small to be detected. Approximately 95% of the circuitry of the precision data system is transistorized. The data output is presented in two forms: a binary-coded-decimal display of azimuth, elevation, and range, and a decimal display of time on a panel which is photographed; and a binary-coded-decimal output of azimuth, elevation, range, and time suitable for recording on magnetic tape. (Author)

Electronics Research Lab., U. of California, Berkeley.
STABILITY OF SYSTEMS WITH RANDOMLY TIME-VARYING PARAMETERS, by A. R. Bergen. Scientific rept. no. 1 on Contract AF 19(604)5466. 9 Feb 60, 20p. 10 refs. Series no. 60, issue no. 268; AFCRC-TN-60-174.
Order from LC mi$2.40, ph$3.30 PB 148 499

Consider a system which alternates between two known configurations at random times; one of these configurations is stable, the other is unstable. Since the unstable mode is intermittent it is entirely possible for the system to be stable despite the unstable mode. Since the system is random, stability must be defined in a probabilistic sense. In this report a system is defined to be stable if the return to equilibrium of the system after any finite disturbance is "almost sure," i.e., if the system returns to equilibrium with probability one. The randomness of the system resides entirely in the intervals between successive alterna-

tions of system configuration. Assuming these intervals to be independent, the expected values of the state variables after an arbitrary number of alternations of system configuration may be determined. By use of the Kronecker product the expected values of the squares of the state variables may also be determined; the expected values of the squares of these state variables tend exponentially to zero with the number of alternations if the eigenvalues of a specified matrix lie within the unit circle. Furthermore, because of this exponential convergence the stronger condition of convergence with probability one may be established. The problem of determining conditions for stability then reduces to the investigation of the eigenvalues of a matrix. If stability with variation of a parameter is to be investigated a root-locus plot of the eigenvalues with parameter adjustment is convenient. (Author)

Electronics Research Lab., U. of California, Berkeley.
STUDY OF CROSSED-FIELD AMPLIFIERS, by J. R. Whinnery, C. K. Birdsall and others. Interim final rept. for 15 Oct-30 Nov 59, on Contract DA 36-039-sc-74981. [1959] 22p. 3 refs. AD-236 172.
Order from LC mi$2.70, ph$4.80 PB 149 410

Fabrication of the second model of the crossed-field velocity analyzer has continued. This model includes means for reducing the effects of secondaries and for water cooling the anode. In the derivation of the crossed-field diode equations reported earlier, all transverse derivatives were neglected. This implies that the magnetic fields produced by the displacement and convection currents are unimportant. A study was made to determine the range of conditions under which this is true. This work incidentally answers similar questions for the Llewellyn-Peterson equations. (Author)
(See also PB 148 108)

Farnsworth Electronics Co., Fort Wayne, Ind.
MODIFICATION OF VIDEO INTERCONNECTION EQUIPMENT ANDB TYPE 2.3NS4a. Final development rept. on Contract NObsr-64276. [1959] 23p. 2 refs.
Order from LC mi$2.70, ph$4.80 PB 147 955

This report covers the modifications to the ANDB Type 2.3NS4a Video Interconnection Equipment in accordance with Addendum No. 3 to ANDB Specification 2.3NS4a. Complete technical information is contained in the instruction book for this equipment (Navships 92770). This report details the modifications necessary to increase the capabilities of the equipment to provide compatability with the latest ANDB radar safety beacon system. (Author)

Flight Research Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
NAVIGATIONAL SYSTEMS COMBINING INERTIAL AND GROUND VELOCITY VECTOR INFORMATION, by John E. Clemens, Wolfram Kerris, and Friedrich Wazelt. Apr 52, declassified 28 July 60. 40p. 4 refs. WADC Technical rept. 52-76; ATI-169 180.
Order from LC mi$3.00, ph$6.30 PB 150 148

This report released for sale to the public 13 Sep 60.

Gilfillan Bros., Inc., Los Angeles, Calif.
MULTICOLOR PLAN POSITION INDICATOR FOR USE IN THE AIR TRAFFIC CONTROL RADAR SAFETY BEACON SYSTEM. Final engineering rept. for 1 Jan-28 Feb 58 on Contract NObsr-72571. 7 Mar 58, 31p. 1 ref.
Order from LC mi$3.00, ph$6.30 PB 147 961

The objective of this contract is to provide a radar Plan Position Indicator on which pulse coded beacon returns can be displayed in seven color hues depending on the code-to-color assignment.

Horizons, Inc., Cleveland, Ohio.
FERROELECTRIC MEMORY CELLS, by Richard A. Fotland. Final rept. on Contract AF 19(604)5498. Apr 60, 4 refs. AFCRC-TR-60-140.
Order from LC mi$3.60, ph$9.30 PB 148 816

Techniques have been developed for obtaining 20 micron films of sodium niobate and barium-lead titanate ceramics. Inferences derived from the switching voltage-film thickness curves indicate that the sodium niobate crystallites are surrounded by a 10^{-6} cm parelectric skin. Switching voltages as low as 20 volts have been utilized with switching pulse lengths of 50 μsec. A 15 megacycle read-out voltage functions effectively. The second-harmonic phase of an output current provides a nondestructive read-out. Ten by ten matrices have been examined with a static address and found to possess good uniformity. Coincidence switching is effective due to the high loop squareness when operating in the second-harmonic output mode. Indications are presented which show the feasibility of large matrix sizes. (Author)

[ITT] Labs., Nutley, N. J.
TESTS OF TACAN SYSTEM WITH REDUCED BEACON SPECTRUM, by A. Biagi and J. Hobbs. Final rept. on Contract NOas-51-1227. 20 July 56, 136p. Technical memo. no. 576; includes Technical momo. no. 569.
Order from LC mi$6.90, ph$21.30 PB 147 960

A series of measurements was conducted of the effects of co-channel and adjacent-channel interference on the AN/ARN-21 in accord with procedures prepared by the Air Navigation Development Board. The first results of the work gave some performance figures concerning the effect of co-channel and adjacent-channel interference on range accuracy, bearing accuracy and identity fidelity, using ARN-21 equipments manufactured in the Summer of 1955. These figures showed that, under the conditions of the tests, the "hole-punching" effect of the airborne Ferris discriminator degraded the otherwise excellent bearing accuracy of the Tacan System. While such deterioration had never been observed in actual flight, there was reason to believe that the problem might become of some importance in the future when many more beacons would cover a given area. The present memorandum describes the greatly improved results obtained by removing the Ferris discriminator from the airborne equipment, while simultaneously reducing the beacon spectrum. This change not only reduces errors but increases the operating range and reduces vulnerability to jamming. Minor improvements have also been made to the airborne decoding circuitry in order to reduce co-channel interference.

Knights, James, Sandwich, Ill.
PHASE STABLE OVERTONE CRYSTAL STUDY, by Robert E. Christian. Quarterly rept. no. 1, 1 July-1 Oct 57, on Contract DA 36-039-sc-74884. [1957] 34p. 4 refs.
Order from LC mi$3.00, ph$6.30 PB 149 105

A literature survey disclosed that a lateral force applied along a diameter of a crystal would cause a frequency deviation. The magnitude of the frequency deviation varied with changes in diameters in which the force was applied and points of minimum frequency deviation was noted. Mathematical calculations show that nodal points of AT crystals are located $\pm 40^{\circ}$ from the Z axis. The static capacitance of the experimental crystals was lower than outlined in the specs. The temperature coefficients of the crystal were measured. Representation crystals were tested for phase shift and the data obtained showed no clear trend. A new crystal vibration holder has been designed which equals the JPL holder in performance but is superior in convenience to use. Two Teflon mounted crystals were tested for phase stability. They appeared promising in the Y and Z plane but were very unsatisfactory in the X plane.

Knights, James, Co., Sandwich, Ill.
PHASE STABLE OVERTONE CRYSTAL STUDY, by Robert E. Christian. Quarterly rept. no. 2, 1 Oct 57-1 Jan 58, on Contract DA 36-039-sc-74884. [1958] 45p. 2 refs.
Order from LC mi$3.30, ph$7.80 PB 149 106

Modification of the constant acceleration apparatus has minimized frequency shift due to the apparatus. Application of pressure along various diameters of an AT crystal showed that a point of minimum frequency shift occurs at 30° off the Z axis at room temperature (23°C). Six groups of crystals were mounted every five degrees from $15\text{-}40^{\circ}$ off the Z axis and phase stability measurements were made. An analytical proof is presented verifying the theory that the reorientation of the nodal points with respect to temperature is a function of the changes in the elastic coefficients with temperature. (See also PB 149 105)

Knights, James, Co., Sandwich, Ill.
PHASE STABLE OVERTONE CRYSTAL STUDY, by Robert E. Christian. Quarterly rept. no. 3, 1 Jan-1 Apr 58, on Contract DA 36-039-sc-74884. [1958] 25p. 1 ref. AD-200 892.
Order from LC mi$2.70, ph$4.80 PB 149 107

Analytical and experimental investigations are being made of crystallographic orientations and crystal plate mountings in order to minimize phase instability when the crystal unit is subjected to mechanical vibration. Distributed capacity changes in the leads between the crystal and the external oscillator were minimized by the use of a series mode oscillator. A series mode oscillator constructed with vacuum tubes for mounting on the shaker head proved unsatisfactory. A transistor grounded base oscillator also proved unsatisfactory because of inadequate output. Laboratory test results on 3 crystal units were in agreement with phase stability measurements made at Fort Monmouth. Solder mounting of crystals resulted in improved resistance characteristics but not of phase stability. The elastic properties of AT cut crystals differed from those of α quartz. (See also PB 149 106)

Knights, James, Co., Sandwich, Ill.
PHASE STABLE OVERTONE CRYSTAL STUDY, by Robert E. Christian. Quarterly rept. no. 4, 1 Apr-1 July 58 on Contract DA 36-039-sc-74884. [1958] 25p.
Order from LC mi$2.70, ph$4.80 PB 149 108

When compressional stress is applied to an "AT" crystal, the frequency of thickness-shear modes would vary due to the deformation of the crystal. The change of frequency Δf of the plate in the strained state as a function of the components of strain tensor has been derived. For an infinitesimal deformation, the strain is linearly related to the stress through a matrix $S^{1} = a_{c}^{-1}\, S\, a^{-1}$. The matrix elements S'_{jk} were expressed in terms of elastic modulii of α quartz and the skew angle Ψ in "AT" plane. Consequently Δf as a function of Ψ and stress was obtained. Analysis showed that at a particular angle Ψ, compressional stress would cause a zero phase shift for an "AT" crystal of a definite strain distribution. An "AT" crystal subjected to a constant lateral force resulted in points of minimum frequency shift 30° on each side of the Z axis. The points of minimum frequency shift are the same regardless of the magnitude of stress. Preliminary evidence indicates that there may be no point of zero frequency shift in the bending direction. (See also PB 149 107)

Lansdale Tube Co., Pa.
GERMANIUM PNP OR NPN JUNCTION TRANSISTOR, by James A. Sluss, Jr. Quarterly progress rept. no. 1, 26 May-26 Aug 58, on Contract DA 36-039-sc-75046. [1958] 38p. Philco no. R-218.
Order from LC mi$3.00, ph$6.30 PB 149 372

The necessary techniques for electrochemically etching and plating large area etch pits and electrodes on diffused germanium material have been developed, and large area, micro-alloyed, diffused-base transistors have been fabricated. The fabricative procedure of the device is being modified to meet the specification limits. The loss of the collector diode during the micro-alloying operation has considerably reduced the yield of units that have a satisfactory VCE of 60 volts. Micro-alloying of indium electrodes into diffused germanium blanks is being accomplished through the use of a focused light beam, which heats the electrode. A profile curve which will permit accurate placement of the emitter and collector in the diffused field and yield units which will closely approach the specification limits has been determined. An optical concentricity gauge for determining the concentricity and diameter of the emitter and collector electrodes has been devised. A new thermal stud mount which theoretically achieves a 400mw dissipation to free air has been designed. (Author)

Lansdale Tube Co., Pa.
GERMANIUM PNP OR NPN JUNCTION TRANSISTOR, by James A. Sluss, Jr. Quarterly progress rept. no. 2, 26 Aug-26 Nov 58, on Contract DA 36-039-sc-75046. [1958] 27p. Philco no. R-218.
Order from LC mi$2.70, ph$4.80 PB 149 373

An increased yield in the accurate placement of the emitter diode was the result of a modification of the gradient of diffusion in the base material. Emitter diode placements in the 10 to 20 volts V_{EB} range are easily accomplished. A reduction of the bulk resistivity of the base material has considerably improved the punchthrough condition of this device. Loss of collector voltage during the microalloying operation was studied through the use of specially constructed equipment that monitors the punchthrough condition as the collector or emitter breakdown voltage is measured. Modification of the testing requirements for the V_{CE} measurement might possibly provide a means of surmounting a seemingly incompatible relationship between V_{CE}, V_{EB}, and high current β. Test data indicates that some value of emitter-to-base resistance or an $\approx$0.1 volt reverse bias will produce a considerable improvement in the V_{CE} characteristic. (Author)

Lansdale Tube Co., Pa.
NUCLEAR RADIATION RESISTANT POWER TRANSISTORS, by A. Byer. Quarterly progress rept. no. 3, 15 Nov 59-15 Feb 60, on Contract DA 36-039-sc-78307. [1960] 28p.
Order from LC mi$2.70, ph$4.80 PB 149 376

The first group of power transistors was sent to MIT for the required irradiation. A higher temperature was experienced for those transistors receiving the 10^{14} NVT dosage. To combat this, the next group sent will call for successive smaller amounts of radiation, leading to the same total dosage. Collector-to-header soldering was causing BV_{CBO} degradation. Through extensive experimentation with heating techniques, solder composition, and type of electrode, this problem has been eliminated. The emitter pits were found to be concave in shape. This causes a higher resistivity at the center of the electrode than at the outer edges. Considerable improvement has been made in the pit geometry. The base tab connection, and its subsequent removal operation, have both been altered. The gold-arsenic whisker has been eliminated. The base index tab is now soldered to the base pin to serve as the electrical connection, and the excess tab is sheared off. Another collector degradation problem is that which occurs with the passage of time. This is separate and distinct from the collector degradation that was caused by header mounting. Attempts thus far have not eliminated this condition and are still being continued. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
PELTIER EFFECT AND THERMAL-CONDUCTIVITY MEASUREMENT TECHNIQUES FOR THERMOELECTRIC MATERIALS, comp. by Kenneth D. Carroll. June 59, 137p. 450 refs. LMSD-288 195. AD-237 470.
Order from LC mi$6.90, ph$21.30 PB 148 068

This selective bibliography covers the period 1950-1958. The literature of particular interest is that of the Peltier, Seebeck, and Joule-Thompson Effects as well as certain studies of thermal conductivity. The tellurides, in particular lead telluride, was the only thermoelectric material designated as being of primary interest. There was, therefore, no attempt to cover the rapidly expanding field of thermoelectric materials. Semiconductors were only of tangential interest; hence, reference is made only to those writings that were of interest to those who had originally requested compilation of the bibliography. The literature of both thermoelectric materials and semiconductors has been treated extensively in other publications. Sources for materials cited included: Chemical Abstracts, Nuclear Science Abstracts, Science Abstracts ASTIA, and Lockheed Missile and Space Division, Technical Information Center. (Author)

Mallory, P. R., and Co., Indianapolis, Ind.
RESEARCH AND DEVELOPMENT IN CONNECTION WITH MINIATURE VARIABLE RESISTORS, by Howard Reeve. Final rept. for 1 Mar 53-30 Sep 55 on Contract DA 36-039-sc-42655. [1955] 90p. 7 refs.
Order from LC mi$4.80, ph$13.80 PB 149 013

Efforts have been directed toward the research, development, and testing of materials and methods to establish designs for four specific types of miniature resistors and a single pole, single throw switch. Resistor designs developed include the 1/2 inch diameter bushing mount resistor with attached single pole, single throw switch, the 1/2 inch diameter flat mount resistor, the 3/8 inch diameter bushing mount resistor, and the 5/16 inch diameter multiturn resistor.

Mellon Inst., Pittsburgh, Pa.
HIGH TEMPERATURE PRINTED CIRCUITRY, by G. H. Young, C. H. T. Wilkins and others. Quarterly rept. no. 11, third series, 1 Apr-30 June 59, on Computer Components Fellowship no. 346, Contract AF 19(604)1959. 4 Apr 60, 31p. 29 refs. AFCRC-TN-60-361.
Order from LC mi$3.00, ph$6.30 PB 149 143

Continuation of investigations on printed circuitry has shown that non-glaze-containing, screen-printed conducting patterns comprised of silver-platinum alloys are feasible for use as two-dimensional electrodes. Tables of physical properties of refractory materials, including borides, nitrides, carbides, and silicides, considered pertinent to past and present investigations are given. Bulk alloy ultimate tensile values for the Ag-Pt alloy system at firing temperatures from 1000 to 1500°C on two substrates are given and acceptable combinations of variables are indicated. Bonding of silver-glaze enamels to alumina is discussed and illustrated photomicrographically. In addition, a number of effects encountered in firing screen-printed conducting films are shown and correlation of the Ag-Pt films with the binary phase diagram is discussed. The utilization of rhodium as a barrier layer between evaporated-film capacitor electrodes and dielectric has produced capacitors of acceptable electrical characteristics. (Author)
(See also PB 144 545)

Mellon Inst., Pittsburgh, Pa.
HIGH TEMPERATURE PRINTED CIRCUITRY, by G. H. Young, C. J. Owen and others. Quarterly rept. no. 12, third series, 1 July-30 Sep 59, on Computer Components Fellowship no. 347, Contract AF 19(604)1959. 13 Apr 60, 33p. 12 refs. AFCRC-TN-60-577.
Order from LC mi$3.00, ph$6.30 PB 149 144

Screen-printed electrode films of alloyed silver and platinum powders and containing no glaze constituent are shown to have exceptionally good adhesion to refractory substrates and acceptable conductivity. These fired, electrically-conducting films should prove adaptable to high temperature circuitry. Extensive physical and electrical property data pertinent to these films are presented in tabular summaries. The physical variations in geometry of the Ag-Pt screen-printed electrodes of 5 to 60% Ag content are presented for illustrative purposes. The utilization of evaporation-annealing, or vacuum deposition on a hot substrate, as a substitute for cycle-annealing of Au-Pd thin film resistors is discussed. Resistance versus temperature sample curves for resistors annealed by both methods and monitored simultaneously are presented. The effect of electron bombardment on the electrical properties of high temperature resistors and capacitors fabricated in the laboratory is discussed. Radiation damage varied from none for the screen-printed enamel resistors to a permanent effect for film capacitors. (Author) (See also PB 149 143)

Mellon Inst., Pittsburgh, Pa.
HIGH TEMPERATURE PRINTED CIRCUITRY, by G. H. Young, C. J. Owen and others. Quraterly rept. no. 13, third series, 1 Oct-31 Dec 59, on Computer Components Fellowship no. 347, Contract AF 19(604)1959. 13 Apr 60, 40p. 10 refs. AFCRC-TN-60-578.
Order from LC mi$3.00, ph$6.30 PB 149 145

Continued investigations on essentially two-dimensional electronic components showed that laboratory-fabricated thin film capacitors were relatively temperature-insensitive up to about 300°C. A test circuit diagram for a more automated method for the elevated temperature testing of capacitors is described. As a preliminary step in the investigation of a newly-assigned research area, inorganic wire coatings and encapsulating compounds, a literature survey of the mechanism and rate of formation of oxides in general and of litanium and zirconium oxides is presented. Radiation tests on screen-printed and vacuum-evaporated resistors showed that, at the highest level of electron bombardment utilized, the resistors were unaffected during irradiation. Tensile and electrical resistance data are presented for screen-printed metallized alloy conducting films containing a glassy phase, with and without a molten silver phase, to show the degree of effect of silver on bond strength and electrical resistance. Photomicrographs of scraped capacitor dielectric films show that, in the absence of a barrier layer over the gold electrode, the gold diffuses or migrates laterally into and through the dielectric. (Author) (See also PB 149 144)

Mellon Inst., Pittsburgh, Pa.
HIGH TEMPERATURE PRINTED CIRCUITRY, by G. H. Young, C. J. Owen and others. Quarterly rept. no. 14, third series, 1 Jan-31 Mar 60, on Computer Components Fellowship no. 347, Contract AF 19(604)1959. 13 Apr 60, 53p. 16 refs. AFCRC-TN-60-579.
Order from LC mi$3.60, ph$9.30 PB 149 146

Continued investigations on high temperature, passive, 2 D components have included a literature survey of the mechanism and rate of formation of oxides, the second section being presented in this report. An apparatus for determining the gross effect at temperature of differential expansion between thin film (0.001" thick) enamels, screen-printed and fired on ceramic substrates, is described and illustrated. The useful operating temperature of the laboratory-developed, screen-printed $MoSi_2$ resistor has been raised from 500 to about 650°C. A systematic investigation of such related parameters as type and amount of glaze constituent, wetting agent, firing time and temperature, and type of substrate is presented in tabular form. The probable nature of the high-resistance film formed between a printed and fired Ag:Pt electrode and one end of an $MoSi_2$ resistor is discussed. The high temperature testing of miniature, single crystal dielectric capacitors by manual methods indicates tentatively that only a dielectric approaching single crystal properties will suffice in developing an adequate component. Initial studies on the effect of temperature on contact angle of compressed glaze pellets on silver, as a preliminary step in the development of dielectric coatings for silver wire, are discussed and illustrated. The temperature coefficient of resistance of evaporated Au:Pd alloy resistor films of controlled but widely varying thickness was found to remain essentially constant. (Author) (See also PB 149 145)

Michigan U. Research Inst., Ann Arbor.
TABLES OF d', by P. B. Elliott. Technical rept. no. 97 on Contract AF 19(604)2277. Oct 59. 44p. 3 refs. 2659-7-T; AFCRC-TR-59-55.
Order from LC mi$3.30, ph$7.80 PB 148 803

Tables of d' for yes-no and forced-choice experiments are presented along with explanations of the assumptions involved in the calculations. (Author)

Microwave Lab., Stanford U., Calif.
BASIC MICROWAVE RESEARCH. Scientific rept. no. 22, 1 Jan-31 Mar 60, on Contract AF 19(604)1930. May 60, 26p. 1 ref. M. L. Rept. no. 723; AFCRC-TN-60-587.
Order from LC mi$2.70, ph$4.80 PB 149 592

Contents:
Microwave tube studies
Plasma physics studies
Ferrite studies
(See also PB 148 028)

Microwave Lab., Stanford U., Calif.
A DISCUSSION OF PERIODICALLY LOADED WAVEGUIDES, BASED ON THEIR REPRESENTATION BY N PERIODICALLY COUPLED 'MODAL' TRANSMISSION LINES, by Emmanuel T. Feuchtwang. Scientific rept. no. 21 on Contract AF 19(604)1930. Apr 60, 245p. 22 refs. M. L. rept. no. 710; AFCRC-TN-60-390.
Order from LC mi$11.10, ph$37.80 PB 149 248

Contents:
The representation of a waveguide, periodically loaded by widely spaced obstacles, as a single, periodically loaded, 'modal' transmission line

The representation of a waveguide periodically loaded by closely spaced obstacles as n periodically coupled 'modal' transmission lines
The measurement of the approximate susceptance matrix of an obstacle in a uniform waveguide

Microwave Lab., Stanford U., Calif.
MODE-JUMPING CAVITY FOR FLOATING-DRIFT-TUBE KLYSTRONS, by J. J. Shaw and D. K. Winslow. Technical rept. on Contract DA 36-039-sc-73178. Oct 59, 37p. M. L. rept. no. 659; SEL Technical rept. no. 352-1; AD-232 383.
Order from LC mi$3.00, ph$6.30 PB 148 333

A new method is described for increasing the frequency-tuning band of high-power, CW microwave oscillators of the floating-drift-tube type. An important advantage of the system is that it would require a voltage tuning ratio on the tube of only 1.5, which is the same as required for $f_2/f_1 = 1.22$ in a single mode system. It is shown experimentally that a tube cavity can be designed so that both the parallel and series modes will have the proper RF voltage ratios between output and input gaps required for efficient operation. It is further shown to be experimentally possible to satisfy a simultaneous condition on the frequency separation between the series and parallel modes so that they will be mutually noninterfering. A cold test cavity was built, and measurements of voltage ratios and mode separation showed reasonable values over the entire 3/2 frequency turning range.

Microwave Lab., Stanford U., Calif.
SOLID-STATE, TWO-LEVEL, HIGH-POWER MASER, by H. John Shaw. Quarterly progress rept. no. 1, 1 Dec 59-29 Feb 60, on Contract DA 36-039-sc-85263, continuation of Contract DA 36-039-sc-72785. Apr 60, 14p. ML rept. no. 707; AD-236 801.
Order from LC mi$2.40, ph$3.30 PB 149 382

Several aspects of pulsed microwave generation using ferrites are currently being investigated. Cold test measurements have been made on the original S-Band generator. Full scale K-band components have been constructed for the K-band generator. Significant advances have been made in pulsed magnetic field production, which now make available pulsed fields suitable for a millimeter wave generation. Various millimeter wave generation schemes to utilize these pulsed fields have been considered, and components have been fabricated for one of these schemes. (Author)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
X-BAND BEACON FERRITE DUPLEXER, by G. J. Wheeler. Quarterly progress rept. no. 1, 1 Apr-30 June 59, on Contract DA 36-039-sc-78802. 8 July 59, 8p. AD-227 266.
Order from LC mi$1.80, ph$1.80 PB 149 412

Research concerns the development of an X-band beacon ferrite duplexer. The duplexer consists of a tee circulator and a limiter. Tee circulators meeting the requirements of phase 1, i.e., covering 9.3 to 9.5 kmc, had been constructed before the contract was received. A design for a phase 2 model, covering 8.5 to 9.6 kmc, was developed and preliminary tests indicate there will be no difficulty in meeting the specifications. A ferrimagnetic limiter is being developed experimentally. Insertion loss and threshold are too high, but were reduced substantially from earlier models. Several geometries and materials are being tested. Thus far, the results are satisfactory only over a narrow band. (Author)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
X-BAND BEACON FERRITE DUPLEXER, by G. J. Wheeler. Quarterly progress rept. no. 3, 1 Oct-31 Dec 59, on Contract DA 36-039-sc-78802. 12 Jan 60, 13p. AD-232 107.
Order from LC mi$2.40, ph$3.30 PB 149 413

A broad band Tee requiring less critical tolerances in fabrication was developed. A tunable ferrimagnetic limiter was also developed using a shunt cavity in a constant magnetic field. Low insertion loss and low threshold are still mutually exclusive. (Author) (See also PB 149 412)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ON STUDY OF MICROWAVE FERRITE DUPLEXER, by Laurence Levey. Quarterly rept. no. 1, 1 Apr-30 June 58, on Contract DA 36-039-sc-78000. 12 Sep 58, 32p. 4 refs. Rept. R-682.3-58; PIB-610.3.
Order from LC mi$3.00, ph$6.30 PB 149 111

Techniques employed to fabricate toroidal ferrite elements for rectangular waveguide have been detailed. The remanent magnetism of toroidal structures has been utilized to obtain a differential phase shift of 23 degrees per inch in rectangular waveguide. The feasibility of constructing switching devices using ferrite toroids has been demonstrated. Ferrite compositions in preparation to produce new square loop materials for switching applications have been described. The theoretical differential phase shifts obtained with a number of composite ferrite-dielectric geometries in coaxial lines and rectangular waveguide have been computed. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ON STUDY OF MICROWAVE FERRITE DUPLEXER, by L. Levey. Quarterly rept. no. 2, 1 July-30 Sep 58, on Contract DA 36-039-sc-78000. 28 Oct 58, 9p. 1 ref. Rept. R-682.6-58; PIB-610.6.
Order from LC mi$1.80, ph$1.80 PB 149 112

Ultrasonic techniques of fabricating ferrite toroids, for use in waveguide switches, have been explored. After some development, proper tools have been fabricated and the technique has been proven to be feasible. The differential phase shift, due to ferrite toroids in a rectangular waveguide, has been measured with the toroids centralized in the waveguide and with the toroids laterally displaced. Surprisingly enough, the laterally displaced toroids gave up to 50% more differential phase shift per unit length than the centralized ones. Ferrite materials are being sought which have a combination of good square loop and switching properties and also have good microwave properties. Exploration

of some Magnesium Manganese ferrite is promising in that some measurements showed various compositions had excellent microwave properties. (Author) (See also PB 149 112)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STUDY OF MICROWAVE FERRITE DUPLEXER, by L. Levey. Quarterly rept. no. 3, 1 Oct-31 Dec 58, on Contract DA 36-039-sc-78000. 25 Mar 59, 9p. Rept. R-682.9-59; PIB 610.9.
Order from LC mi$1.80, ph$1.80 PB 146 452

Ferrite toroids have been produced by both a compression molding process and an ultrasonic cutting technique in an amount sufficient to assemble several 90 degree differential phase shift sections for RG-52/U waveguide.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STUDY OF MICROWAVE FERRITE DUPLEXER, by L. Levey. Quarterly rept. no. 4, 1 Jan-31 Mar 59, on Contract DA 36-039-sc-78000. 29 May 59, 9p. Rept. R-682.12-59; PIB-610.12; AD-225 431.
Order from LC mi$1.80, ph$1.80 PB 146 453

The compression molding process has been employed to fabricate toroids which have a width of 0.170" as compared to 0.210" for units previously produced. Two 90 degree differential phase shift sections containing an axial wire have been matched to within a VSWR of 1.3 over a frequency range of 8.6 to 9.5kmc. (Author) (See also PB 146 452)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STUDY OF MICROWAVE FERRITE DUPLEXER, by L. Levey. Quarterly rept. no. 5, 1 Apr-30 June 59, on Contract DA 36-039-sc-78000. 1 Sep 59, 12p. Rept. R-682-15-59; PIB-610.15.
Order from LC mi$2.40, ph$3.30 PB 146 451

The examination of methods of reducing the volume of ferrite material per degree of differential phase shift was continued. Computations of differential phase shift were made for a waveguide configuration consisting of permanently magnetized ferrite slabs separated by a dielectric material. (See also PB 146 453)

Mohawk Business Machines Corp., Brooklyn, N. Y.
DEVELOPMENT OF A DUAL SPEED, DUAL CHANNEL-DUAL TRACK MAGNETIC TAPE RECORDER-REPRODUCER AN/UNH-1 ( ), by W. F. Heine and S. Duckstein. Final engineering rept. on Contract DA 36-039-sc-52600. May 57, 85p. AD-148 233.
Order from LC mi$4.80, ph$13.80 PB 149 397

The results of this development indicate that the requirements of studio equipment quality and complexity field type ruggedness, and low weight in equipment of this kind cannot be realized simultaneously. It is entirely feasible to combine any two of these objectives and obtain a finished item at reasonable cost, but not all three. The primary instance of this conflict is the drive mechanism, wherein the requirements for studio type tape speed accuracy, and ruggedness could have been achieved with no particular difficulty, had it not been complicated by the weight factor. What is especially troublesome in this respect is that weight begets weight, not linearly, but with some higher order relationship.

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
DATA TRANSMISSION IN THE PRESENCE OF INTERFERENCE, by R. M. Showers, R. S. Berkowitz and others. Final rept. for 1 May 58-30 June 59 on Project ADAR, Task C, Contract DA 36-039-sc-75047. 31 July 59, 135p. 4 refs. AD59URI, v. 3; AD-235 997.
Order from LC mi$6.90, ph$21.30 PB 149 393

Studies involve (1) the effects of interference in producing baud errors in a digital data transmission system and (2) the relative efficiency of various error detecting schemes in reducing the number of undetected errors in a transmitted message. The performance of AM and PM systems using standard teletype transmission in the presence of noise recorded from an actual transmission circuit was investigated. A baud error probability considerably less than one error in 10^5 can be expected with such circuits. From theoretical calculations of the performance of AM, FM, and PM systems in the presence of this type of interference it was concluded that the binary PM system is about 3 db better than AM or FM transmission. A procedure for predicting the performance of such systems is suggested. Of the five detection codes studied in the presence of random, grouped, and periodic errors, the transverse-longitudinal parity check proved to be quite superior to the others. (Author)

National Aviation Facilities Experimental Center, Atlantic City, N. J.
CHARACTERISTICS OF A VOR ON A 200-FOOT TOWER, by Sterling R. Anderson and Robert B. Flint. Final rept. Apr 60, 37p. 2 refs.
Order from OTS $1.00 PB 161 949

A mobile VOR station located in a cleared area 200 feet square at one corner of a heavily wooded site was flight tested. A maximum course scalloping of plus or minus 11.5° was recorded at a radius of 20 miles and an altitude of 1,000 feet. Later, a VOR antenna was erected on a 200-foot tower with a 60-foot-diameter counterpoise. Similar flight tests indicated a scalloping maximum of plus or minus 0.5°. A 20-mile-radius orbital flight in the first null (1.2°) produced scalloping of plus or minus 6° maximum. The distance range, for a receiver input signal of 5 microvolts, varied from 63 miles at 300 feet altitude to 175 miles at 9,000 feet altitude. It is shown that with an antenna 200 feet above ground, while there still are objectionable course bends in the nulls of the vertical plane radiation pattern, the detrimental effect of the site on VOR performance was reduced at low elevation angles, and the low-altitude coverage was extended. This type of installation should be useful in heavily wooded terrain where a suitable site cannot be obtained for the installation of a more conventional station.

National Bureau of Standards, Washington, D. C.
OXIDE COATED CATHODE SUBLIMATION STUDIES, by Glenn F. Rouse. Scientific rept. no. 3, 1 Feb 57-31 Dec 58. 4 Feb 59, 21p. 2 refs. NBS rept. 6286; AFCRC-TN-59-158; AD-211 448.
Order from LC mi$2.70, ph$4.80 PB 147 399

A sensitive vacuum microbalance has been used to study the sublimation characteristics of some samples of uncoated cathode nickel. The results of this study are presented. A study of the coated cathode has been started. As an initial step the changes in mass which occur during the thermal conversion of the carbonates have been determined. The data obtained are discussed. (Author)

Naval Ordnance Lab., White Oak, Md.
A BINARY COUNTER AND ACCUMULATOR USING TRANSISTORS AND MAGNETIC CORES, by H. R. Irons. 23 Oct 58, 30p. NAVORD rept. 6184; AD-210 060.
Order from LC mi$2.70, ph$4.80 PB 147 565

Binary devices are described which employ a transistor-magnetic core combination as a fundamental building block for digital circuits. These devices are capable of high operating speeds and yet require very little power at low operating speeds. For example, a five stage binary counter has a total power consumption of 40 micro watts when operated at a counting rate of 100 pulses per second. The same counter is capable of operation at rates as high as 2×10^6 pulses per second. Good reliability is indicated by the fact that a counter has been operated successfully over a temperature range of $-65^{\circ}F$ to $160^{\circ}F$ with a supply voltage of -2.0 volts to -4.5 volts. (Author)

Naval Ordnance Lab., White Oak, Md.
A NARROW BAND LOCK-IN ANALYZER AND SLAVE ANALYZER, by A. Zed Robinson. Rept. for Dec 47-Sep 51 on Improved Noise Analyzers. 15 Jan 58, 15 Jan 58, 65p. 7 refs. NAVORD rept. 4420; AD-158 517.
Order from LC mi$3.90, ph$10.80 PB 147 570

This report describes a novel method for obtaining narrow band frequency analysis using RC circuits as the filtering elements. Normal ambiguities due to frequency and amplitude modulation of discrete components are eliminated by providing the analyzer with two quadrature phase channels. A lock-in circuit allows considerable more information to be obtained on discrete components. The use of this analyzer in conjunction with a slave analyzer is also described. This allows positive identification of discrete signals at different parts of a vibrating system. (Author)

Naval Research Lab., Washington, D. C.
AN IMPROVED DC CURRENT-INTERRUPTER UNIT, by C. H. Presbrey, Jr., and S. Schuldiner. 14 July 60, 22p. 2 refs. NRL rept. 5472.
Order from OTS $0.75 PB 161 437

An improved design for a dc current interrupter has been developed at this Laboratory. This improvement was made in an effort to remedy certain operational difficulties encountered in the use of an existing model and also to provide for further studies at higher cell-current levels. In its present application to electrochemical studies, the current interrupter is part of an overall system consisting of the interrupter, a cell-current dc meter, a cell (with probe), an external power supply for the cell and for gating-stage bias, a peak-to-peak ac voltmeter, and an oscilloscope for visual or photographic analysis of the interrupted waveform. The specifications of the improved interrupter include the following features: current range from 10 μamp to 400 ma, pulse repetition rate from 1 cycle to 10 kc, pulse length from 1 μsec to 0.1 sec, pulse rise-and-fall time of 0.25 μsec. This unit has been used in the study of the time vs potential characteristics of electrochemical solution IR drops and of the cleanliness of the associated electrode metals. (Author)

Naval Research Lab., Washington, D. C.
INSTRUMENTATION FOR THE CLASSIFICATION OF SPACE SIGNALS, by F. T. Powles. Interim rept. 21 July 60, 19p. 4 refs. NRL rept. 5488.
Order from OTS $0.50 PB 161 515

The detection and identification of nonradiating satellites require a system designed to provide a phase difference of two incoming signals from a common source which can be translated to an angular position for the source, and a record from which input intensities over the duration of the signal may be derived, both related to an accurate time scale. The Navy's Space Surveillance System, based on the interferometer principle, was designed to satisfy these needs. The classification of signals from this system requires a knowledge of as many as possible of the characteristics by which the identity can be established. In the measurement of the characteristics of the signals obtained from the SPASUR system, it has been found that equipment available for the processing and analysis of the data in general does not have the accuracy or high speed required for a precise determination of short-duration signal characteristics. Improvement of existing instruments and development of new equipment to meet these performance requirements is being investigated. (Author)

Naval Research Lab., Washington, D. C.
REGULATED LINEAR TRANSFORMER-RECTIFIER POWER SUPPLIES, by D. S. Toffolo. Interim rept. 27 July 60, 19p. NRL rept. no. 5494.
Order from LC mi$2.40, ph$3.30 PB 146 392

The NRL unit described in this report, without using any filtering components, has an essentially linear input impedance per phase, is lighter for the same rating than present operational units procured from commercial sources, utilizes the more economical standard grades of transformer steels, and has equal if not superior regulation characteristics, particularly under transient conditions. The regulation control scheme is relatively simple, rugged, and reliable. As a further reliability feature, the unit is capable of delivering power at the same regulation as the ac primary input power even when the control components fail. The NRL unit incorporates several new features in a conversion unit of this type. They are a

multiwinding synthetic secondary, series compensation, flux switching to obtain regulation, and tertiary windings to suppress harmonics, particularly those due to the rectifiers. Additional control features can be added, depending upon the degree of regulation desired.

New York U. Coll. of Engineering, N. Y.
CONTROL SYSTEM WITH MINIMUM SPECTRAL BANDWIDTH PF PLANT INPUT, by James C. Hung. Rept. on Contract AF 49(638)586. May 60, 21p. 2 refs. Technical rept. 400-9; AFOSR-TN-60-493.
Order from LC mi$2.70, ph$4.80 PB 148 943

A design method for control systems that minimizes the spectral bandwidth of the plant input signal is discussed. The plant input signal is minimized subject to the constraint that the integral square error for deterministic inputs or the mean square error for random inputs be limited to a known desired value. The control system transfer function that satisfies these requirements is derived, and the functions used in bandwidth shaping are discussed. An example of a system design using this technique is given. (Author)

Ohio State U. Research Foundation, Columbus.
MICROWAVE TUBE RESEARCH ON BARKHAUSEN-KURZ CAVITY-TYPE OSCILLATORS AND A TRANSVERSE-FIELD TRAVELING-WAVE TUBE, by Dean T. Davis, Fang-Shang Chen, and E. M. Boone. Final rept. on Contract AF 18(600)982. Dec 59, 61p. 15 refs. AFOSR-TN-60-134.
Order from LC mi$3.90, ph$10.80 PB 149 261

An electron tube employing a magnetically focused electron stream moving in an electric field resulting from a parabolic potential distribution can be operated as a Barkhausen-Kurz oscillator. Electrons traveling in such a potential distribution execute simple harmonic motion, and insofar as an accurate parabolic potential distribution is achieved, the frequency of the electron oscillations will be independent of the amplitude of the motion. If the interaction gap of a cavity resonator is located at the center of such a potential distribution and the resonator is tuned to an odd integral multiple of the frequency of simple harmonic electron motion, the electrons can then remain in proper phase to deliver energy to the high-frequency field of the resonator on successive transits. Oscillators of this type have been investigated at wavelengths of 3 cm, 1 cm, and 6 mm. Two types of geometries have been utilized, one having symmetry about the plane of a flat electron beam, and the other being symmetrical about the axis of a cylindrical electron beam. These tubes have exhibited low starting currents, wide electronic tuning ranges, and efficiencies of 12 to 14 percent in the 3 cm and 1 cm wavelength range. A detailed theoretical analysis has been completed, and is well correlated by experiment.

Ohio State U. Research Foundation, Columbus.
PARAMETRIC AMPLIFICATION, by Marlin O. Thurston. Final rept. on Contract AF 19(604)4060. May 60, 53p. 21 refs. AFCRC-TR-60-145.
Order from LC mi$3.60, ph$9.30 PB 149 166

This research was concerned with the capabilities and limitations of parametric amplifiers of the non-linear capacitance type. The dependence of junction capacitance on bias voltage for various special impurity distributions near the junction was calculated theoretically. It was found possible to obtain a moderately large rate of change of capacitance with voltage at a reverse bias voltage large enough to make the capacitance itself small. The implications of this design for high-frequency, high-sensitivity amplifiers were considered. Diodes embodying this idea were constructed and initial tests were made. In support of the work on diode characteristics it was necessary to extend the theory of parametric amplifiers. The results obtained permit the performance of a parametric amplifier to be related to the capacitance characteristic of the diode, even at moderately high-signal level. Experimental frequency multipliers and parametric amplifiers were constructed and tested at various frequencies from audio to 23 kMc. The main purpose of this part of the work was to provide systems for use in making comparative operating tests of experimental diodes. (Author) (See also PB 143 192)

Philco Corp., Philadelphia Pa.
INVESTIGATION OF PHYSICAL LIMITATIONS ON CURRENT GAIN (BETA) AND RESEARCH ON IMPROVED SILICON CONTACTS, by Leon L. Maissel and James P. Spratt. Final rept. for 1 Apr 58-31 Mar 59 on Contract AF 19(604)3894. 30 Apr 59, 22p. 10 refs. H-2162-F; AFCRC-TR-59-157; AD-216 765.
Order from LC mi$2.70, ph$4.80 PB 148 553

This report comprises two principal studies: an investigation of the factors limiting the grounded emitter current gain (β) of a transistor, and research on improved contacts for silicon. Theoretical analysis of β limitations suggested a technique for evaluating the relative importance of the factors known to affect current gain. Attempts to apply this technique experimentally yielded anomalous results. These discrepancies, as yet unexplained, indicate that it is not possible to produce high-gain and/or high-frequency devices by biasing transistors near punch-through voltage. The first step in the study of improved silicon contacts was to determine the possibility of developing a micro-alloy structure for silicon. When experiments showed that such a device, while possible, would not be adaptable to large-scale production, this work was discontinued. Attention was then turned toward a silver-antimony contact. A method of jet-plating silver onto silicon was developed. The effect of silver alloying on lifetime was investigated; no adverse effect was noted. A study was made of diffusion from a plated contact as a method of producing a good injecting contact of small area. It was concluded that this method does not yield usable contacts.

Radiation Research Corp., New York.
NUCLEAR BATTERIES, by John H. Coleman and Arthur P. Pinkerton. Final progress rept., 15 Aug-15 Nov 57, on Contract DA 36-039-sc-73115, continuation of Contract DA 36-039-sc-71132. [1957] 35p. 10 refs. AD-160 419.
Order from LC mi$3.00, ph$6.30 PB 149 104

The battery components (source, collector and enclosure) were tested separately to obtain general design data and batteries constructed to test these principles. In regard to components, first, tritium-

titanium sources were prepared and tested for helium 3 and tritium evolution. Tests using a mass spectrograph indicate no measurable evolution after 67 days. Tests using an ion chamber indicate model R life is 32,000 days at room temperature and 2,000 days at 75°C and R2 life is 930,000 days at room temperature and 5,200 days at 75°C. Secondly, a new electrophoresis process was developed to deposit the carbon collector with a minimum of impurities. Thirdly, enclosures for Models R and R2 types were designed and drawn from flat CRS with copper plating. In regard to battery models, two types (RS and R2S) were designed for 1000°C processing. Also electrical data was taken which indicated Model R and R2 output current as a function of internal gas pressure. (Author)

Radiation Research Corp., New York.
VACUUM TRITIUM NUCLEAR BATTERY, by Joseph Thomas-Hazel, Bernard Caras and others. Final rept., 15 June-14 Dec 58, on Contract DA 36-039-sc-78047. [1958] 64p. 9 refs. AD-218 856.
Order from LC mi$3.90, ph$10.80 PB 149 113

A new battery design was evolved which incorporates a ceramic terminal and a complete processing schedule was developed for constructing these batteries on a special large-bore double-pumping vacuum system. Batteries were fabricated and subjected to life tests. (Author)

Radio Corp. of America, Harrison, N. J.
RUGGEDIZATION OF TWO TYPES OF S-BAND PULSED PENCIL-TUBE-AND-CAVITY TRANSMITTER UNITS. VOLUME I. RESEARCH AND DEVELOPMENT PROGRAM, by R. K. Reusch, D. W. Power, and R. E. Brooks. Final rept. for 17 May 57-10 July 59 on Contract DA 36-039-sc-74808. [1959] 182p. 5 refs. AD-236 221.
Order from LC mi$8.40, ph$28.80 PB 149 607

The development and the ruggedization are described of two types of S-band, pulsed, pencil-tube-and-cavity transmitter units. Volume I contains a description of the work done, test procedures and results, conclusions, and recommendations concerning RCA Developmental Type Nos. A-15134 grid-pulsed and A-15135 plate-pulsed units. The work has produced transmitter units with increased reliability and the following major features: good stability in frequency and power output when subjected to linear acceleration forces of at least 10,000 g's, forces of shock, vibration, and rotation, changes in temperature, and mismatched loads. In addition, the units possess increased life, low rf power leakage, and uniform drive requirements. The report contains two studies by R. K. Reusch: "A Theoretical Analysis of Rieke Diagram Interpretation," and "A Theoretical Analysis of Starting-Time Delay." (Author)

Radio Corp. of America, Harrison, N. J.
RUGGEDIZATION OF TWO TYPES OF S-BAND PULSED PENCIL-TUBE-AND-CAVITY TRANSMITTER UNITS. VOLUME II. MANUFACTURING SPECIFICATIONS, by R. K. Reusch, D. W. Power, and R. E. Brooks. Final rept. for 17 May 57-10 July 59 on Contract DA 36-039-sc-74808. [1959] 105p. AD-236 222.
Order from LC mi$5.70, ph$16.80 PB 149 608
See also PB 149 607

Raytheon Co., Waltham, Mass.
INVESTIGATION OF THE CORRELATION OF STANDARD DIODE EMISSION STUDY CONTRACT FINDINGS WITH PRODUCTION TYPE TUBES USING STANDARD PRODUCTION EQUIPMENT, by F. Hill, C. Bardsley and others. Final Scientific rept., 15 Dec 58-15 Jan 60, on Contract AF 19(604)4095. 4 Apr 60, 50p. AFCRC-TR-60-133.
Order from LC mi$3.30, ph$7.80 PB 149 574

Controlled laboratory exhaust tests have shown that the three variables affecting the emissive qualities of a vacuum tube are: time (length of exhaust cycle), cathode temperature during the exhaust cycle, and vacuum pressure conditions during the exhaust cycle. A program was initiated to study two exhaust machines: one with poor pumping speed, and one with vastly improved pumping speed. It has been demonstrated that the main variable affecting the pumping speed of the two exhaust units is the conductance of the plumbing connections between the vacuum tube exhaust stem and the pump. The conductance of the plumbing connections was improved by increasing the diameter of the piping. The first series of tests was run to study the effect of machine speed variations, with the same exhaust lighting and induction heating schedule on both units, upon the emissive qualities of the 6AH6 vacuum tube. It was concluded from these tests that machine speed variations from 500 to 1200 tubes per hour do not affect the life burning characteristics of the 6AH6 vacuum tubes regardless of the exhaust unit. (See also also PB 148 123)

RCA Defense Electronics Products, Camden, N. J.
MICRO-MODULE PRODUCTION PROGRAM. Quarterly rept. no. 7, 1 Oct 59-1 Jan 60, on Contract DA 36-039-sc-75968. [1960] 212p. AD-234 690.
Order from LC mi$9.60, ph$33.30 PB 149 375

Production and testing of nearly all final-grade elements was accomplished. The process of molybdenum-manganese metallizing combined with ultrasonically assisted soldering was adopted as a method for producing reliable hermetic seals of semiconductor and quartz crystal units. All required digital modules of prototype-grade were completed and are undergoing tests. Forty-eight prototype-grade modules of sixteen different types have accumulated 62,000 module-hours of 85°C operating life-tests. (Author) (See also PB 146 042)

RCA Labs., Princeton, N. J.
BRIGHTNESS INTENSIFIER STUDY, by G. A. Morton, J. E. Ruedy and others. Rept. for 15 Sep 54-30 Nov 56 on Light Amplification, Contract AF 33(616)2631. May 60, declassified. 54p. 6 refs. ARL Technical rept. 60-284.
Order from OTS $1.50 PB 161 945

The basic limits of vision and image detection are discussed. Experimental results with the direct view intensifier are reported. A general discussion of pickup tube limitations concludes that the image intensifier orthicon is a very suitable pickup tube for a brightness intensifier amplifying a low light scene. Other intensifications methods and storage operation of intensifier orthicons are also investigated and discussed. The use of the image intensifier orthicon for optical pulse ranging is suggested. (Author)

RCA Defense Electronics Products, Camden, N. J.
MICRO-MODULE PRODUCTION PROGRAM. Quarterly rept. no. 6, 1 July-1 Oct 59, on Contract DA 36-039-sc-75968. [1959] 157p. 3 refs.
Order from OTS $3.00 PB 161 911

Electrical testing of prototype micro-elements was substantially completed during this quarter and environmental and life tests were initiated. Fifty prototype modules were assembled and encapsulated, and given electrical tests. Further evaluation is underway. The final printed wiring layouts for the micro-modular AN/PRC-36 Receiver and for three required subassemblies were completed. The design is compatible with the Program packing density objective of a quarter million parts per cubic feet. (Author)

Remington Rand Univac Div., Sperry Rand Corp., Philadelphia, Pa.
MATHEMATICAL CIRCUIT ANALYSIS AND DESIGN. Scientific rept. no. 1 on Contract AF 19(604)5189. 29 Feb 60, 40p. AFCRC-TN-60-358.
Order from LC mi$3.00, ph$6.30 PB 148 222

This report describes the attempt to develop a mechanized routine for the design and fault diagnosis of electronic circuits, summarizes the progress to date, and suggests areas for future study. Fault diagnosis has been considered initially, since (1) it seems to be the more tractable of the two, and (2) circuit design is considered to be a direct extension of fault diagnosis, requiring the incorporation of the worst case criterion and a method of optimization. A unique method has been devised for translating any schematic diagram into computer language so that each component and its location is specifically described. A method has been established and programmed for the Univac computer to generate the complete set of irredundant nodal and branch equations which will handle both linear and nonlinear characteristics of the circuit parameters. Finally, the set of equations has been reduced by eliminating all variables not required for solution of the component parameters. A sample circuit is given and a copy computer printout accompanies the description of each stage of the analysis. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
MODEL EXPERIMENTS ON A CAP LOADED FOLDED ANTENNA, by Donald L. Fehr and William C. Smith, Jr. June 60, 21p. 2 refs. RADC-TR-60-31.
Order from LC mi$2.70, ph$4.80 PB 149 326

This report describes tests and test results of the cap loaded folded antenna. These tests were conducted to determine application of the concept for 34 to 105 kc antenna applications for Air Force communications. The antenna uses top loading and folding techniques which yield an input resistance of 50 ohms at 0.04 wavelength. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
RADC RELIABILITY NOTEBOOK, by Joseph J. Naresky. Rept. prepared by McGraw-Hill Book Co. on Contract AF 30(602)1752. 30 Oct 59, 281p. 114 refs. RADC TR-58-111; AD-148 868.
Order from OTS $4.00 PB 161 894

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Smyth Research Associates, San Diego, Calif.
REFRACTION ERRORS IN THE SPACE-POSITIONING OF HIGH FLYING OBJECTS, by L. J. Anderson, L. G. Trolese, and L. R. Hughes. Final rept. on Contract AF 30(602)1867. Nov 58, 50p. 10 refs.
RADC [TR] 58-170; SRA-74; AD-148 887.
Order from LC mi$3.30, ph$7.80 PB 149 256

Sonotone Corp., Elmsford, N. Y.
STUDY OF SEALED NICKEL-CADMIUM BATTERIES, by Paul Ritterman. Final rept. for 1 Dec 58-31 Jan 60 on Research Investigations to Develop and Evaluate a Nickel-Cadmium Battery Having a Hermetically Sealed Construction, and to Study Its Reaction Mechanisms, Contract DA 36-039-sc-78249. [1960] 76p. 13 refs.
Order from LC mi$4.50, ph$12.30 PB 149 026

The life cycling program, using size "D" hermetically sealed cells filled with varying concentrations and amounts of electrolyte, was concluded after 608 cycles. Results of periodic capacity tests made during the entire cycling program are shown. Sealed cells were constructed for the experiment to test the effects of cobalt addition to the positive plates, lithia addition to the electrolyte and variation of negative/positive capacity ratios. The rate of reaction with oxygen of cadmium plates was investigated, within a sealed chamber, under varying conditions of oxygen pressure, mole fraction of oxygen and electrolyte concentration. Hermetically sealed cells were constructed with a special side opening so that it was possible to measure pressure build-up on charge and discharge by connection to a gauge. An experiment was designed to test the effect of temperature and initial cell atmosphere on the charge and discharge characteristics of the sealed cell. The effects on pressure build-up during charge and discharge were also studied. A relatively low recombination pressure (average = 12.4 psig) was found for the three cells tested when they were charged at the 3 hour rate (1.8 amperes).

Sperry Gyroscope Co., Great Neck, N. Y.
INVESTIGATION OF MICROWAVE WINDOW FAILURE MECHANISMS AND THEIR ELIMINATION, by D. Churchill and E. Cheatham. Quarterly progress rept. no. 2, 1 Sep-1 Dec 59, on Contract DA 36-039-sc-78314. Jan 60, 45p. 12 refs. Sperry rept. no. NA-8240-8182-2; AD-235 611.
Order from LC mi$3.30, ph$7.80 PB 149 027

The trajectories of electrons in an evacuated cylindrical waveguide under the fields of propagating rf energy were calculated. The results indicate an axial drift in the direction of propagation; this may be contributory mechanism in the charging of dielectric windows. The ghost-mode resonant frequencies of a thick, self-resonant structure were calculated using Forrer's equations. The solutions are presented as universal curves for various dielectric constants. These solutions were then compared with experimental values; the results were favorable. A survey of literature pertaining to radiation effects in inorganic solids was assessed. Radiation damage, such as color centers in the alkali halides, is primarily the result of ionization and excitation caused by electrons and X rays. A number of structures were selected for transmission measurements and bandwidth studies. The disc window with a short cylindrical section has produced the most promising results. A double-disc assembly was constructed for breakdown tests. Two material samples were subjected to 100-kv electron bombardment. The alumina sample was apparently undamaged; the Vycor sample showed indications of minor radiation damage. (Author) (See also PB 147 972)

Sperry Gyroscope Co., Great Neck, N. Y.
TRANSISTORIZED GYRO MAGNETIC COMPASS SET. Final engineering rept. for Aug 57-Feb 59 on Contract DA 36-039-sc-74871. Aug 59, 47p. 2 refs. Rept. no. LA-3254-0028; AD-227 162.
Order from LC mi$3.30, ph$7.80 PB 149 023

Design plans for four Gyro Magnetic Compass Sets were completed and submitted. Sperry was requested to redesign and convert the two sets with rotating pointer indicators to rotating dial indicators. This design incorporates integral lighting in both the rotating dial indicators and the rotating dial repeaters. Redesign of the two compass sets was accomplished and accepted. Fabrication of all four sets was completed. Testing of the compass sets to establish compliance with Procurement Specification SCL-1802 was completed. Evaluation of test data indicated that over-all performance of the compass sets is satisfactory.

Stanford Electronics Labs., Stanford U., Calif.
CORRUGATED WAVEGUIDE FILTERS WITH SPECIFIED STOP-BAND CHARACTERISTICS, by M. Crane and D. J. Grace. Rept. on Contract DA 36-039-sc-73151. 31 Jan 58, 62p. 8 refs. Technical rept. no. no. 152-4; AD-160 471.
Order from LC mi$3.90, ph$10.80 PB 149 407

This report treats the design of corrugated filters for which both pass-band and stop-band characteristics have been specified. Following a review of the general corrugated-waveguide matrix and a summary of image-parameter techniques, it is shown that considerable simplification results when the guide wavelengths in both the transmission waveguide and the slots are the same. A procedure is described for designing a filter in sections, with each section composed of a cascade of identical filter elements which accomplishes one of the design objectives. This technique is illustrated by the design of a filter with a pass band from 8.0 to 15.0 kMc and a stop band from 15.0 to 21.0 kMc. The attenuation was required to rise at least 10 db per 100 Mc above the 15.0 kMc lower cutoff and remain 40 db or more throughout the stop band. The sequence of construction and measurement for this filter is discussed, and the experimental results are presented. Of the many important filter constructions for which the general corrugated-waveguide matrix must be used, ridge waveguide and dielectric or paramagnetic loading are perhaps the most common. The results of some preliminary work using changes in the permeability of ferrite to shift the cutoff frequencies of a corrugated filter are discussed briefly. (Author)

Stanford Electronics Labs., Stanford U., Calif.
A CROSSED-FIELD MULTI-SEGMENT DEPRESSED COLLECTOR FOR BEAM-TYPE TUBES, by D. A. Dunn, R. P. Borghi, and G. Wada. Rept. on Contract AF 33(616)6207. 21 Sep 59, 22p. 8 refs. Technical rept. no. 102-1; AD-227 051.
Order from LC mi$2.70, ph$4.80 PB 147 615

The velocity-dependent action of crossed electric and magnetic fields can be used to sort the electrons of the spent beam of a klystron or traveling-wave tube into two or more velocity classes and to collect each class of electrons at a potential appropriate to its velocity. Secondary electrons produced at the collection surfaces do not return to the interaction space of the tube because of the nonreciprocal action of the crossed fields. An experimental tube permitted two-segment operation with 20 per cent of the beam power dissipated in the collector at small signals. Velocity sorting was observed that permitted operation near this percentage of beam power over a considerable range of r-f signal levels. (Author)

Stanford Electronics Labs., Stanford U., Calif.
ELECTRON DEVICES RESEARCH. Consolidated Quarterly status rept. no. 10, 1 Apr 30 June 59, on Contracts DA 36-039-sc-73178, AF 33(616)6207, AF 33(600)27784, AF 19(604)1847, Nonr-225(40), and Nonr-225(24). [1959] 89p. 54 refs. AD-225 862.
Order from LC mi$4.80, ph$13.80 PB 149 408

See also PB 147 014

Stanford Electronics Labs., Stanford U., Calif.
A HELICAL MICROWAVE ANTENNA FEED, by W. H. Huntley, Jr. Rept. on Contract DA 36-039-sc-73151. 30 Sep 57, 17p. 10 refs. Technical rept. no. 461-3; AD-144 454.
Order from LC mi$2.40, ph$3.30 PB 149 406

Design and construction of an S band beam mode helix for feeding an offset section of a paraboloid are described. Some measurement data taken with a test helix are given and evaluated for this application. The characteristics described include: beam shape and width; axial ratio; impedance; and location of the phase center. (Author)

Stanford Electronics Labs., Stanford U., Calif.
AN INVESTIGATION OF THE SENSITIVITY OF SOME RECEIVERS HAVING LARGE R-F BANDWIDTH, by J. L. Grigsby. Rept. on Contract DA 36-039-sc-73151. 4 Nov 58, 172p. 18 refs. Technical rept. no. 553-1.
Order from LC mi$8.10, ph$27.30 PB 149 402

An investigation is made of the sensitivity of two types of receivers that have large r-f bandwidth. The receiver types considered are the superheterodyne with distributed-frequency local oscillator, and the crystal-video receiver employing r-f preamplification. The intent of the work is to determine the limiting values of the sensitivity of the receivers when the r-f bandwidth is at least several per cent of the band-center frequency.

Stanford Electronics Labs., Stanford U., Calif.
SOLID-STATE ELECTRONICS RESEARCH. Consolidated Quarterly status rept. no. 1, 1 Oct-31 Dec 58, on Contracts Nonr-225(24), Nonr-225(31), Nonr-225(44), and DA 36-039-sc-73151. [1958] 31p. 55 refs.
Order from LC mi$3.00, ph$6.30 PB 147 345

Abstracts of progress on 20 projects in electronic circuits and materials.

Stanford Electronics Labs., Stanford U., Calif.
TRANSMITTING AND RECEIVING EQUIPMENT FOR S-BAND PROPAGATION STUDIES. PART A. RECEIVER, by R. E. Miller, D. B. Coates, and C. S. Liston. Rept. on Contract DA 36-039-sc-73151. 3 Feb 59, 15p. 2 refs. Technical rept. no. 461-6A.
Order from LC mi$2.40, ph$3.30 PB 149 403

A high-sensitivity S-band receiver is described. Principal design factors of the system leading to a suitable receiver design for beyond-the-horizon propagation experiments are included as well as special circuit features of the receiver.

Stanford Research Inst., Menlo Park, Calif.
APPLIED RESEARCH IN MICROMINIATURE FIELD EMISSION TUBES, by W. W. Hansen. Quarterly progress rept. no. 2, 1 Oct 59-1 Jan 60, on Contract DA 36-039-sc-84526. [1960] 23p. 2 refs. AD-235 643.
Order from LC mi$2.70, ph$4.80 PB 149 380

Characteristics of simulated, microminiature, field emission tubes were studied in apparatus now nearing completion. Important parts of the apparatus are a demountable, ultra-vacuum chamber and a micromanipulator for adjustment of the spacing of tube elements without breaking the vacuum seal. Theoretical studies of a particular triode configuration indicate that power gains of 10 to 20 are realizable if plate loads of several megohms are used. The possibility of significant power gain at frequencies as high as 100 megacycles is implied by inter-electrode capacitances of the order of 10^{-15} farads. Tube dimensions determine whether tube operation is plate-power or emission limited. Maximum plate power becomes the dominant limiting factor as the dimensions of the tube studied are increased. (Author) (See also PB 146 797)

Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF METHODS OF SCANNING THE BEAM OF LARGE ANTENNAS, by M. Gilden and J. S. Honda. Scientific rept. 10, 1 Sep-30 Nov 59, on Contract AF 19(604)2240. Feb 60, 58p. 23 refs. AFCRC-TN-60-394.
Order from LC mi$3.60, ph$9.30 PB 148 758

Gas discharge phase shifters are discussed with a view to determining their applicability to electronic scanning antenna arrays. A description of a gas-discharge plasma is given, and several modes of wave propagation are analyzed. Criteria for evaluation of phase shifters are then specified and applied to the various types of gas-discharge phase shifters described in the literature. It is concluded that a low-power, electronically controlled, gas-discharge phase shifter of small size is feasible at UHF. The second half of the report discusses a 360-degree-azimuth, line-source scanner employing a toroidal bend. (See also PB 144 310)

Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF METHODS OF SCANNING THE BEAM OF LARGE ANTENNAS, by L. A. Robinson and E. M. T. Jones. Scientific rept. no. 11, 1 Dec 59-29 Feb 60, on Contract AF 19(604)2240. Apr 60, 29p. 16 refs. SRI Proj. 2184; AFCRC-TN-60-560.
Order from LC mi$2.70, ph$4.80 PB 149 543

The discussion is devoted to line-source feeds for the mechanical scanning of large spherical reflectors. With present-day large reflectors required for radars and for radio astronomy, the line source which is needed is many wavelengths long, so that leaky-wave type radiators become feasible. Radiation from leaky-wave atennnas can be very accurately controlled in amplitude and phase along the length of the antenna, and it should therefore be possible to approximate very closely the theoretical line source feed requirements. A particular leaky-wave feed design, consisting of a circular waveguide section perforated by narrow, transverse slots, is discussed. The slots are operated below resonance so that the amount of power coupled through each slot can be controlled by means of the slot length, and the phase velocity along the line source can be controlled by means of the waveguide diameter. (Author) (See also PB 144 310)

Sylvania Electronic Systems, Inc., Waltham, Mass.
MULTIWAVE TRANSMISSION LINE, by James D. Kellett. Rept. on Contract AF 19(604)5474. 1 Apr 60, 81p. 11 refs. Scientific rept. no. SR424-1; ERD-TN-60-599.
Order from LC mi$4.80, ph$13.80 PB 149 813

This paper describes an investigation of the electrical properties of a multiwave transmission line. The structure consists of two unbalanced TEM transmission lines whose outer conductors are modified to form either a rectangular or a ridged waveguide. The attenuation, mode cross-coupling, TEM characteristic impedance, and cut-off wavelength properties of this multiwave structure are analyzed both theoretically and experimentally. TEM attenuation of less than 1.5 times the attenuation of a coaxial structure of the same physical dimensions, decoupling between the TEM modes of greater than 50 decibels, and changes in cut-off frequency of less than 8 percent can be realized in the multiwave structure. (Author)

Syracuse U. Research Inst., N. Y.
DIAGNOSIS OF EQUIPMENT FAILURES, by Richard A. Johnson, Earl Kletsky, and John Brule. Technical rept. no. 1 on Contract AF 30(602)1833. Apr 59, 75p. 6 refs. SURI rept. no. EE577-594T1; RADC-TR-59-47; AD-213 876.
Order from LC mi$4.50, ph$12.30 PB 147 540

Recent advances in the design of electronic systems have results in an ever-increasing complexity in such systems. While such complexity is necessary to permit the systems to perform tasks of ever-increasing scope, the problem of keeping the systems in "working" order tends to increase at least as fast as the basic complexity. The present report is concerned with one particular phase of the problem of maintenance - namely the problem of determining which part of an equipment is in need of repair when the equipment as a whole does not function properly. While this is only one aspect of the whole problem of maintaining equipment in working order, any improvement in general diagnostic procedures would result in significant economies. Some of the other factors which contribute to maintainability are the reliability of the basic component parts, proper preventive maintenance procedures, and proper mechanical and electrical design so as to make component parts easily accessible for replacement.

Technical Operations Inc., [Burlington] Mass.
DEVELOPMENT OF POWER TRANSISTOR CIRCUITRY, by R. R. Smyth. Final rept. on Contract DA 36-039-sc-63072. 14 May 56, 77p. 2 refs. Rept. no. TOI 56-13; AD-104 650.
Order from LC mi$4.50, ph$12.30 PB 149 014

The use of a simple transistor push-pull oscillator circuit as a d-c to d-c power converter has been investigated. The transistors act essentially as switches alternately connecting the supply battery across each half of a transformer primary. As a result the transistor dissipation is very low and the circuit efficiency high. Because of the importance of transistor dissipation in determining the maximum power output, considerable attention is given to the problem of determining optimum conditions. The problem of regulating the output voltages has received considerable attention. Three practical circuits have been developed. Satisfactory regulation of a single output for both supply voltage and load current changes has been obtained with a circuit employing saturable reactors in the output circuit. (See also PB 140 106)

Varian Associates, Palo Alto, Calif.
RESEARCH ON MOLECULAR AND ATOMIC RESONANCE DEVICES, by J. C. Helmer and H. E. Weaver. Quarterly rept. no. 7, 1 Jan-31 Mar 59, on Contract DA 36-039-sc-73266. [1959] 41p. 5 refs. Engineering rept. no. 218-7Q.
Order from LC mi$3.30, ph$7.80 PB 146 462

The EPR spectrum of $SrTiO_3$ has been examined over a wide temperature range and the results correlated with earlier measurements on the dielectric properties of this crystal. In thin plate crystals the EPR spectrum reveals an anomalous frozen-in tetragonal splitting which is independent of temperature. This effect is large enough that it masks the temperature dependent splitting predicted on the basis of dielectric measurements. The frozen-in splitting is probably due to strain-release brought about by cutting the thin plates. This hypothesis is supported by measurements at room temperature on a cubic-shaped sample. Additional measurements of the EPR spectrum at low magnetic fields reveal the presence of two unexplained lines of twofold symmetry. (See also PB 145 234)

Westinghouse Electric Corp., Baltimore, Md.
PULSE TRANSMISSION STUDY, by Heinz Fiege-Kollmann. Quarterly Technical note no. 2 on Contract AF 30(602)1866. 24 Feb 59, 135p. 10 refs. RADC-TN-59-82; AD-211 434.
Order from LC mi$6.90, ph$21.30 PB 147 130

Contents:
Telephone facilities
Test message
Test runs
Double differentiation detector
Test runs
Double differentiation detector
Further AM-FM waveform investigation
Synchronization
Matched filters
Appendicies
Tests
Determination of maximum level of input to a leased line
Digital subset
Investigation of transmission signals and tabulation of their WT products
A matched filter design approach
Matched filters in the carrier band
Diagrams of matched filters
Integrated data systems

Westinghouse Electric Corp., Baltimore, Md.
R-THETA TRANSPONDER. Westinghouse Instruction Book. Rept. on Contract NOa(s)-12186. 18 Oct 51, 65p.
Order from LC mi$3.90, ph$10.80 PB 147 949

The R-Theta Transponder is an airborne radio transmitting-receiving equipment used as a radar beacon and as an aid in the identification of aircraft. It is designed primarily to be used in conjunction with ground radars, ASR and PAR. The R-Theta Transponder will permit extending the reliable range of the S-Band Surveillance radars to 100 miles, and the X-Band Precision Approach radars to 15 miles. In addition, the use of the Transponder codes provides positive aircraft identification without maneuvering the aircraft.

Westinghouse Electric Corp., Baltimore, Md.
RHO THETA TRANSPONDER MOD II. Westinghouse Instruction Book. Rept. on Contract NOa(s)-12186. 15 Aug 52, 81p.
Order from LC mi$4.80, ph$13.80 PB 147 950

The Rho Theta Transponder Mod II is an airborne radio transmitting-receiving equipment used as a radar beacon and as an aid in the identification of aircraft. It is designed primarily to be used in conjunc-

tion with ground control approach radars, ASR and PAR. The Rho Theta Transponder Mod II will permit the reliable range of the S-Band Surveillance radars to be extended to 100 miles, and the X-Band Precision Approach radars to 15 miles. In addition, the use of the Transponder codes provides positive aircraft identification without maneuvering the aircraft. (See also PB 147 949)

Westinghouse Electric Corp., Elmira, N. Y.
RESEARCH AND REPORTS ON AN OPTICAL AMPLIFIER, by Joseph Lempert. Rept. on Light Amplification, Contract AF 33(616)2611. May 60, declassified, 82p. ARL Technical rept. 60-283.
Order from OTS $2.25 PB 161 944

The purpose of this contract has been twofold. During Phase A, the object was to find through research new solutions which lead to new and improved types of pickup transducers which are potentially suitable for future development in the military field, especially under low light level conditions. Definite improvement has been accomplished in the threshold by extra dynode multiplication and by image preamplification. Phase B called for investigating the feasibility of producing an imaging pickup tube which would be capable of operating under the vibration encountered in an aircraft in flight. The feasibility of constructing image orthicons with considerably reduced microphonics, and suitable for use in aircraft, was established. (Author)

Ordnance, Missiles, and Satellite Vehicles

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
THE DEVELOPMENT OF IRDOMES, by J. R. Jenness, Jr. Progress rept. for 1 June 51-1 June 53 on TED Proj. ADC EL-889. 21 Aug 53, declassified 28 July 60, 21p. 13 refs. Rept. no. NADC EL-53112.
Order from LC mi$2.70, ph$4.80 PB 149 776

This report released for sale to the public 25 Aug 60.

Experimental work was conducted on reflection-reducing coatings, transmittance measurements, and Kel-F molding. The problem of measuring the transmittance of a sample at large angles of incidence was analyzed and an optical system for these measurements was designed. This report also summarizes the over-all problem of designing irdomes for supersonic guided missiles.

Air Force Cambridge Research Center, Bedford, Mass.
A CATALOGUE OF POSITIONAL DATA OF THE RUSSIAN ARTIFICIAL EARTH SATELLITE DELTA I (SPUTNIK III ROCKET BODY). VOLUME I: TABULATION OF INDIVIDUAL OBSERVATIONS, AND AIR FORCE SIGHTINGS, 16 MAY TO 20 MAY 1958, by W. S. Ripley. Rept. on Project Space Track. 1 Jan 60, 261p. 3 refs. GRDST-11; AFCRC-TN-60-232(I).
Order from LC mi$11.10, ph$41.10 PB 149 179

This catalogue (published in three volumes) contains approximately 100,000 positional data observed during the life of the Russian earth satellite 1958 Delta I (Sputnik III Rocket Body). These data, collected by Space Track, are from two types of sources; those sent in by individuals and various organizations from all over the world and those produced by United States Air Force facilities. The positional data are arranged chronologically with observation station names and coordinates. (Author)

Air Force Cambridge Research Center, Bedford, Mass.
A CATALOGUE OF POSITIONAL DATA OF THE RUSSIAN ARTIFICIAL EARTH SATELLITE DELTA I (SPUTNIK III ROCKET BODY). VOLUME II: AIR FORCE SIGHTINGS, 23 MAY TO 29 AUGUST 1958, by W. S. Ripley. Rept. on Project Space Track. 1 Jan 60, 258p. GRDST-11; AFCRC-TN-60-232(II).
Order from LC mi$11.10, ph$39.60 PB 149 180

See also PB 149 179.

Air Force Cambridge Research Center, Bedford, Mass.
A CATALOGUE OF POSITIONAL DATA OF THE RUSSIAN ARTIFICIAL EARTH SATELLITE DELTA I (SPUTNIK III ROCKET BODY). VOLUME III: AIR FORCE SIGHTINGS, 30 AUGUST TO 30 NOVEMBER 1958, by W. S. Ripley. Rept. on Project Space Track. 1 Jan 60, 265p. GRDST-11; AFCRC-TN-60-232(III).
Order from LC mi$11.10, ph$41.10 PB 149 181

See also PB 149 180

Air Force Cambridge Research Center, Bedford, Mass.
A CATALOGUE OF POSITIONAL DATA OF THE U. S. EARTH SATELLITE 1958 ZETA (PROJECT SCORE), by W. S. Ripley. Rept. on Project Space Track. 1 Jan 60, 140p. 3 refs. GRDST-12; AFCRC-TN-60-233.
Order from LC mi$6.90, ph$21.30 PV 149 178

This catalogue contains approximately 16,000 positional data observed during the life of the U. S. earth satellite 1958 Zeta (Project Score). These data, collected by Space Track, are from two types of sources; those sent in by individuals and various organizations from all over the world and those produced by United States Air Force facilities. The positional data are arranged chronologically with observation station names and coordinates. (Author)

Air Force Cambridge Research Center, Bedford, Mass.
SOLUTIONS OF THE PROBLEM OF ARTIFICIAL SATELLITE THEORY WITHOUT DRAG, by Dirk Brouwer (Yale U. Observatory). Rept. on Project Space Track. Oct 59, 48p. 3 refs. GRDST-10; AFCRC-TN-59-638.
Order from LC mi$3.30, ph$7.80 PB 149 177

Sections 1 - 6 give the solution of the main problem for a spheroidal earth with the potential limited to the principal term and the second harmonic which contains the small factor k_2. The solution is developed in powers of k_2 in canonical variables by a method which is basically the same as that used in a different problem by von Zeipel (1916). The periodic terms are divided in two classes: The short-period terms contain the mean anomaly in their arguments: the arguments of the long-period terms are multiples of the mean argument of the perigee. The periodic terms, both of short and long period, are developed to $O(k_2)$; the secular motions are obtained to $O(k_2^2)$. The results are obtained in closed form; no series developments in eccentricity or inclination arise. The solution does not apply to orbits near the critical inclination, 63.4°, but is otherwise valid for any eccentricity < 1 and any inclination. Section 7 gives the long-period terms and the additions to the secular motions caused by the fourth harmonic in the potential; section 8 gives the contributions by the third and fifth harmonics; section 9 contains formulas for computation. (Author)

Air U., Maxwell AFB, Ala.
AEROSPACE GLOSSARY, by Woodford Agee Heflin. Sep 59, 118p. Documentary Research Study AU-282-58-RSI.
Order from LC mi$6.00, ph$18.30 PB 149 447

The work list has been arrived at by noting words and phrases spoken by people engaged in aerospace research, development, and operations, also by noting terms found in the current periodical and book literature of missiles, astronautics and related fields. A large number of quotations have been extracted from aerospace literature, each quotation illustrating a manner in which a particular term is used. As a result, the definitions are based upon an analysis of both spoken and written usage, fortified by consultations with knowledgeable persons in residence at Air University, in missile industry, and at AF research and development and test centers. This glossary attempts only to describe and explain usage not to prescribe it.

Allied Research Associates, Inc., Boston, Mass.
LAUNCHING OF AIRBORNE MISSILES UNDERWATER. PART IV. OPTIMUM LAUNCHER HEADING IN A CONFUSED SEA, by Theodore R. Gordon and Irving Frank. Rept. on Contract Nonr-2343(00). 30 Oct 59, 49p. 5 refs. Document no. ARA-701; AD-229 080.
Order from LC mi$3.30, ph$7.80 PB 149 510

When a missile is launched underwater in a confused sea, mean-square trajectory responses (e. g. angle of attack, pitch angle, etc.) can be calculated. These variances, in turn, define a bivariate Gaussian probability density function. It is assumed here that a particular launch is successful if, at a certain time, a particular response falls within the confines of a square region whose sides are fixed with respect to the launcher. By changing the launcher heading the square is rotated with respect to the directional properties of the sea, and the probability of successful launch is thereby altered. It is the objective of this report to discover that particular launcher heading which gives maximum probability of success. The results are applied both to sea-type and swell-type disturbances, and some numerical illustrations are included. It is concluded that significant improvement in the probability of successful launch is obtained by optimizing launcher heading under virtually all sea conditions likely to be encountered. (Author)
(See also PB 147 711)

Arctic Aeromedical Lab., Ladd AFB, Alaska.
SUITABILITY OF INSULATED CONTAINERS FOR TRANSPORT OF MATERIAL WITH CRITICAL THERMAL TOLERANCES TO COLD, by John R. Cavanaugh. July 57, 6p. Technical note AAL-TN-57-43.
Order from LC mi$1.80, ph$1.80 PB 146 630

The container, Blood Shipping, Stock No. Med. 6515 NSL (figure 1), was evaluated to determine whether a packing method could be sufficient to protect thermocritical fluids from freezing during air shipment in cargo type aircraft which do not employ supplemental heating systems for the cargo compartment. The container and its test contents were subjected to repeated exposure to ambient temperature conditions ranging from $+62^{\circ}$F to -34° F and the container was found to amply protect its contents from freezing for periods in excess of 9 hours. (Author)

Army Transportation Environmental Operations Group, Fort Eustis, Va.
PRELIMINARY INVESTIGATION OF DESERT TRANSPORTATION, by Daniel F. Richards. June 60, 35p. 8 refs.
Order from LC mi$3.00, ph$6.30 PB 149 222

The report contains discussions of desert environment, operation and maintenance of wheeled vehicles, methods of navigation utilized by USATREOG, reconnaissance, and night operations. (Author)

Avco-Everett Research Lab., Mass.
HIGH POWER PULSE STEEPENING BY MEANS OF EXPLODING WIRES, by G. S. Janes and H. Koritz. Apr 59, 20p. 3 refs. Research rept. 50.
Order from LC mi$2.40, ph$3.30 PB 147 201

A circuit technique is described which reduces the rise times of high power pulses by means of exploding wires. Using this technique, a mangetic field of 10,000 gauss is built up in .15 microseconds throughout a volume 4 cm in length and 10 cm in diameter. The best results are obtained with high conductivity fuse materials such as copper or aluminum.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
ELECTRONIC MISSILE ACQUISITION SYSTEM BY MEANS OF FM/FM TELEMETRY INSTRUMENTATION, by K. H. Patterson. Aug 53, declassified [15 Dec 53]. 14p. Technical note no. 817; AD-91 098.
Order from LC mi$2.40, ph$3.30 PB 148 646

A method of obtaining trajectory data from the FM-FM telemetry carrier by means of highly specialized receivers is proposed. These receivers would provide

a means of comparing the phase of the signal received by two antennas spaced a known distance apart. Problems involved and inherent limitations are discussed. While accurate predictions are impossible present considerations indicate that such a system should prove to be a valuable asset in the field of electronic instrumentation. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
MACRO-PELLET PROJECTION WITH AN AIR CAVITY HIGH EXPLOSIVE CHARGE FOR IMPACT STUDIES, by John H. Kineke, Jr., and Lee S. Holloway. Apr 60, 12p. 5 refs. Memo. rept. no. 1264; AD-237 944.
Order from LC mi$2.40, ph$3.30 PB 148 905

A series of high explosive charges has been developed for projecting steel pellets at velocities sufficiently high for terminal ballistic investigations of hypervelocity crater formation. The air cavity charge suggested by Deas and Zimmerman has been the basis for designing a number of charges projecting pellets whose masses and velocities are statistically reproducible within 3%. Pellet masses range from 0.15 to 8.86 grams and velocities from 1.99 to 5.43 km/sec. Mass determination and velocity measurement techniques are described. These charges are currently being used for extensive, and economical hypervelocity crater studies. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE ORBIT OF A SATELLITE OF AN OBLATE PLANET, by Boris Garfinkel. Dec 59, 39p. 7 refs. Rept. no. 1089.
Order from LC mi$3.00, ph$6.30 PB 149 237

The report gives a solution of the problem of motion of a particle in the potential field
$V = -1/r + J_2P_2(\sin\theta)/r^3 + J_4P_4(\sin\theta)/r^5$,
where J_2 and J_4 are small parameters. The first approximation is furnished by a V_0 that incorporates the major effect of the second spherical harmonic and leads to a closed solution with no secular variations of order J_2. The perturbations of this non-Keplerian intermediary orbit are derived here by the von-Zeipel modification of the method of Delaunay. The secular variations are carried up to orders J_2^2 and J_4, and the periodic variations to orders J_2 and J_4/J_2. A computational summary is included, and the effect of the third spherical harmonic is appended. (Author)

Ballistic Research Lab., Aberdeen Proving Ground, Md.
RESEARCH AND DEVELOPMENT OF OPTICAL TRACKING METHODS AND INSTRUMENTATION AT THE BALLISTIC RESEARCH LABORATORIES, by Dirk Reuyl and Walter Carrion. May 60, 60p. 23 refs. Rept. no. 1103.
Order from LC mi$3.60, ph$9.30 PB 148 903

Problem areas discussed include determination of missile trajectories, measurement of missile attitude and recording of special events in flight, determination of target intercept by guided missiles, observation of small missiles at great distances, evaluation of missile performance in the terminal phase of flight, especially that pertaining to the functioning of the warhead, as well as atmospheric optics research and studies of detection, acquisition and tracking. Instrumentation systems described include cinetheodolites, tracking telescopes T-1 to T-5 of various types, the IGOR intercept system, the large aperture SMT instrument for small missiles, the TET, WAF and IMP telescopes for terminal trajectory, warhead functioning and impact proximity problems, respectively, and the RT-1 and RT-2 research telescopes. (Author)

Boeing Airplane Co., Seattle, Wash.
PITCH AXIS CONTROL SYSTEM, FC-110, by L. Rupel. Rept. on Contract AF 33(038)19589. 10 Feb 56, 67p. Document no. D-16954 A; AD-88 517.
Order from LC mi$3.90, ph$10.80 PB 150 296

This report released for sale to the public 19 Sep 60.

The purpose of the pitch control system is to control the model 624-7 missile in the pitch plane during all phases of flight. It is composed of the pitch rocket control system and the elevator control system. The circuitry involved in the pitch control system electronics is explained. Packaging considerations are enumerated. Unit requirements and hydraulic and mechanical component requirements are tabulated. Appendixes describe the ring-type instrument amplifier-demodulators, the series demodulator, and the operational magnetic amplifiers.

Centro di Studio per la Fisica Delle Microonde (Italy).
ON THE DETERMINATION OF THE PATH OF THE ARTIFICIAL SATELLITES, by N. Carrara, P. F. Checcacci and L. Ronchi. Technical note no. 1 on Contract AF 61(052)182. Oct 59, 19p. 8 refs. AFCRC-TN-60-151.
Order from LC mi$2.40, ph$3.30 PB 148 779

A method based on the Doppler effect is described for determining some parameters of the path of an artificial satellite and the available approximation discussed. Another system is described which does not require any special hypothesis on the path to be determined. A possible arrangement of the ground equipment is described in detail. This system is very similar to the SPHERODOP system. However, the SPHERODOP system is in general used for tracking the missiles from the starting point. Four stations are required, because the frequency emitted from the missile cannot be considered known. This system is substantially the application of the SPHERODOP to the determination of the orbit of the satellites, in the general case, when the stations do not receive the signals from the starting point.

Centro di Studio per la Fisica delle Microonde (Italy).
TECHNIQUES AND EQUIPMENTS FOR DOPPLER OBSERVATIONS, by P. F. Checcacci. Technical note no. 2 on Contract AF 61(052)182. Oct 59, 43p. 2 refs. AFCRC-TN-60-370.
Order from LC mi$3.30, ph$7.80 PB 148 780

This report describes the apparatuses used for carrying out the measurements on the satellites planning

according to the Space Track Program. The measurements concern the determination of the Doppler effect curves and of the plots of the intensity of the received signal versus the time. The complete apparatus is basically composed of an antenna, a receiver, a recorder, a frequency meter and other auxiliary equipments. Everyone of these elements might be chosen between some different types, with slightly different performances. The apparatus used has been chosen after a number of tests of several types, which are described and discussed.

Department of the Air Force, Washington, D. C.
INTERIM AEROSPACE TERMINOLOGY REFERENCE. 30 Oct 59, 79p. Administrative Practices Pamphlet AFP 11-1-4.
Order from OTS $2.00 PB 161 913

This pamphlet is an interim consolidation of the numerous aerospace terms and definitions that have appeared in various Air Force publications. It is intended to offset the confusion resulting from the inconsistencies of many of those definitions. Here, to the most practical extent, a singular definition has been ascribed to each term, to replace previous multi-definitions. Thus, mutual understanding is promoted. Additionally, this pamphlet provides a meaningful reference-guide, and focuses the attention of Air Force members on the terminology of the aerospace age.

Diamond Ordnance Fuze Labs., Washington, D. C.
FUZE, ROCKET, PDSQ, T2058, by Peter B. Ferrara. Final rept. 29 July 60, 12p. Technical rept. TR-850.
Order from LC mi$2.40, ph$3.30 PB 150 012

The fuze, now in the Engineering and User Test Phases, is a point detonating, superquick, mechanical design for use with the T238, 115-mm Area Toxic Rocket—a high velocity, fin-stabilized, ground-to-ground projectile. The rocket is designed for use with the T145 Multiple Rocket Launcher System. The T2058 fuze employs a modified Mk 181 S&A mechanism. The final laboratory and R&D field test results, drawings, and pertinent photographs are included. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
SPECIFICATION OF ZIRCONIUM FOR USE IN GASLESS MIXTURES, by R. E. McIntyre and M. L. Couch. 9 Mar 60, 36p. 13 refs. TR-821; AD-234 317.
Order from LC mi$3.00, ph$6.30 PB 147 795

Relationship between the properties of zirconium powder and the properties of heat powders or delay compositions, to arrive at a suitable specification. The data show the important points to be specified are the total zirconium content, the ignition gain, the hydrogen content, the particle-size distribution and the surface area. The data show that the burning rate of barium chromate-zirconium delay compositions depends primarily upon the calorific value and secondarily upon the composition.

Frankford Arsenal, Philadelphia, Pa.
THE DETECTION OF FLAWS IN 20mm HEI SHELL, by A. J. Wysoczanski. Dec 58, 39p. 1 ref. Technical rept. no. R-1484.
Order from LC mi$3.00, ph$6.30 PB 150 304

This report released for sale to the public 19 Sep 60.

A detailed description is given of the various electromagnetic techniques that were developed and evaluated in an attempt to detect the presence of surface and sub-surface defects in 20mm HEI shell. Details are given concerning a reluctance technique and two eddy current techniques, and the instrumentaion developed during these studies.

General Electric Co., Schenectady, N. Y.
BIBLIOGRAPHY AND INDEX OF PROJECT HERMES REPORTS, 1945-1950, by W. D. Robusto. Rept. on Proj. Hermes, Contract [DA 30-115-ORD-23]. May 51, declassified 13 May 58. 82p. 804 refs. Technical Information Series rept. no. R51A0515.
Order from LC mi$4.80, ph$13.80 PB 149 208

The material is listed according to a subject, number, and author index. German documents translated by Project Hermes are also included. A listing of the Hermes Bimonthly Surveys is not included in this report. (Author)

General Electric Co., Schenectady, N. Y.
AN EXPERIMENTAL INVESTIGATION OF SUBSONIC DIFFUSER CONFIGURATIONS FOR THE HERMES B-1 RAMJET, by R. E. Geigér. Rept. on Project Hermes [Contract DA 30-115-ORD-23]. Dec 50, declassified 17 Mar 58, 28p. 6 refs. Technical Information Series TR-55274.
Order from LC mi$2.70, ph$4.80 PB 149 468

This report presents the results of an experimental investigation of some of the important parameters affecting the design and performance of subsonic diffusers. The subsonic diffusers tested were of the annular divergent area type common to the after-part of ramjet diffusers. Each configuration was tested with two types of flows: supersonic flow with an internal shock and, completely subsonic flow. (Author)

General Electric Co., Schenectady, N. Y.
MATHEMATICAL DESIGN OF GERIPAC, by E. G. Keller. Rept. on Proj. Hermes, Contract [DA 30-115-ORD-23]. 25 Mar 51, declassified 17 Mar 58. 38p. 1 ref. Technical Information Series rept. no. [R]51A0501.
Order from LC mi$3.00, ph$6.30 PB 149 206

The Geripac (General Electric Radar in Put Automatic Computer) is a binary device which receives signals from a high altitude rocket by means of the General Electric high precision Doppler radar and after smoothing and differentiating azimuth and elevation signals makes a transformation of coordinates from radar to inertial space and computes corrections in the latter space applicable to the rocket for its terminal guidance. (Author)

General Electric Co., Schenectady, N. Y.
PRELIMINARY DESIGN STUDIES FOR A LOW-COST SURFACE-TO-SURFACE MISSILE, by H. M. Mitchell and R. L. Morey. Rept. on Proj. Hermes, Contract [DA 30-115-ORD-23]. Sep 50, declassified 17 Mar 58. 61p. 1 ref. Technical Information Series rept. no. R50A0511.
Order from LC mi$3.90, ph$10.80 PB 149 204

This report covers design studies made for a missile capable of carrying a 500-pound warhead to a maximum range of approximately 75 nautical miles with an accuracy in the order of 300 yards. Comparative designs are made for a liquid and solid propellant missile. (Author)

General Electric Co., Schenectady, N. Y.
VACUUM PATH EQUATIONS OF VARIATIONS IN BOTH RADAR AND INTERNAL COORDINATES, by E. G. Keller and J. E. Crawford. Rept. on Proj. Hermes, Contract [DA 30-115-ORD-23]. July 51, declassified 17 Mar 58. 19p. 4 refs. Technical Information Series rept. no. R51A0504.
Order from LC mi$2.40, ph$3.30 PB 149 207

It is not possible for a simple of complicated digital computer to solve the equations of variation in either radar or inertial coordinates in 10 seconds. Consequently, the equations are set-up and solved in a form containing the initial conditions such that the Hermes A-3 Digital Computer handles the solution instead of the differential equations in 10 seconds. (Author)

General Electric Research Lab., Schenectady, N. Y.
MEASUREMENT OF ROCKET EXHAUST GAS VELOCITY BY SPECTROSCOPIC DOPPLER SHIFT METHOD, by F. P. Bundy and H. M. Strong. Rept. on Project Hermes. 6 Oct 48, declassified 17 Mar 58, 42p. 6 refs. Rept. no. 55269.
Order from LC mi$3.30, ph$7.80 PB 149 467

Considerable effort has been directed toward developing ways of measuring the velocity, temperature and pressure directly from the flame by optical means which do not produce any mechanical disturbance of the flame. This paper presents the method which has been developed for measuring the flame gas velocity.

General Electric Co., Schenectady, N. Y.
A PROPOSED GUIDANCE SYSTEM FOR THE HERMES A3 MISSILE, by A. P. Adamson and R. F. Drenick. Rept. on Project Hermes. [Contract DA 30-115-ORD-23]. 23 Sep 48, declassified 17 Nov 58, 22p. 1 ref. Rept. 55200.
Order from LC mi$2.70, ph$4.80 PB 149 465

A class of guidance systems is desired which eliminates all random first order range errors from short range surface-to-surface trajectories. It is shown that guidance systems of this type can be realized by one properly mounted integrating accelerometer matching its output against that of computer which generates an arbitrary function of the time of flight. Two special systems are discussed in some detail and a combination of the two is recommended for the range control of the Hermes A-3 missile. It is shown that considerable accuracy of hitting can be achieved with existing control equipment. (Author)

Naval Ordnance Lab., White Oak, Md.
THE ACTUATOR, EXPLOSIVE WOX-23A, AN ACTUATOR TO REPLACE ACTUATOR MK 3 MOD 0 IN THE EXPLOSIVE SWITCH MK 46 MOD 0, by E. Eugene Kilmer. 4 May 60, 33p. 1 ref. NAVORD rept. 6761.
Order from OTS $1.00 PB 161 933

In view of Explosive Switch Mk 46 Mod 0 failures, a program was initiated to find a suitable replacement for the Actuator Mk 3 Mod 0. An investigation indicated that the inability of the Olin-Mathieson Ball Powder (W2920.3 Type II class 4) to sustain burning under the leakage condition existing in the Mk 46 Mod 0 Switch to be the cause of the explosive switch failures. Various propellants were investigated both in a variable volume pressure bomb and in the Explosive Switch Mk 46 Mod 0. Of the powders tested, SR4990, a Dupont smokeless powder, gave the desired boundary condition of a fast rise pressure front unaffected by the change of volume in the switch. Consequently, a direct substitution replacing the Olin Mathieson Ball Powder (W2920.3 Type II class 4) by SR4990 (DuPont) will be made in the actuator for the switch Mk 46 Mod 0. The new actuator has been designated Actuator, Explosive, WOX-23A. (Author)

Naval Ordnance Lab., White Oak, Md.
CHARACTERIZATION OF THE MK 1 MOD 0 SQUIB: IMPEDANCE MEASUREMENTS IN THE FREQUENCY RANGE 50-1500 MEGACYCLES, by R. M. H. Wyatt. 31 May 60, 35p. 2 refs. NAVORD rept. 6826.
Order from OTS $1.00 PB 161 934

The impedance characteristics of the Mk 1 Mod 0 Squib were determined by the use of an admittance meter for the frequency range of 50 to 1500 megacycles. In general the reactance values obtained were very close to what could be expected if the squib were considered to be a symmetrical two-conductor parallel transmission line terminated with a 1-ohm resistor (the bridge wire). Under limited conditions of frequency and lead length the investigation showed that the squib could be considered to consist of lumped parameters: pure inductances for the leads within and without the bakelite portion of the plug and a pure resistance for the bridge wire. (Author)

Naval Ordnance Lab., White Oak, Md.
A DESIGN FOR SPHERICALLY DETONATING EXPLOSIVE CHARGES, by C. Randall and R. Clairmont. 5 Apr 60, 30p. 1 ref. NAVORD rept. 6292.
Order from LC mi$2.70, ph$4.80 PB 149 227

A design and technique of fabrication for spherical detonators or detonator-booster combinations are discussed. The detonators are either 0.312 or 0.495 inch in diameter with the outer, secondary explosive initiated from a central sphere of silver azide 0.150 inch in diameter. The primary charge in turn is initiated from a hot spot located on a bridge extending through the detonator. The detonator-booster combinations consist of 0.312-inch diameter detonators imbedded in the initiating 0.750-inch diameter spheres. Examples of the early expansions to be expected from these charges are presented which show that variation in simultaneity of detonation breakout on the charge surface = $\pm$0.15 to 0.20 microseconds, deviation of gas

cloud and early shock contour from the true sphere = 2 to 5 per cent of contour radius, and deviation of contour center from charge center 1/8 to 1/4 charge radius. (Author)

Naval Ordnance Lab., White Oak, Md.
DEVELOPMENT OF WOX-73A AND WOX-74A PRIMERS, by E. Eugene Kilmer. 30 June 60, 18p. 8 refs. NAVORD rept. 6883.
Order from OTS $0.50 PB 161 935

An instantaneous primer, the WOX-73A, and a delay primer, the WOX-74A, have been developed for use in a picket-boat depth-charge pistol. The delay primer has a mean delay time of 18 seconds and operates reliably over the temperature range -65° to 160°F. This primer contains a double cup and a water tight seal which enables it to pass MIL-STD-304 (temperature and humidity cycling). The design of the delay primer is such that at the time of firing the inner cup is ruptured, allowing the gases evolved by the ignition element and the delay powder to be vented. Both primers have identical bridge wire circuits. The energy for 0.50 probability of firing (mean energy), determined by a Bruceton Sensitivity Test, is 4200 ergs. The energy for 0.999 probability of firing was calculated to be 5650 ergs. The WOX-73A and WOX-74A primers have been subjected to the standard environmental tests and have functioned properly following these tests. (Author)

Naval Ordnance Lab., White Oak, Md.
DISCRIMINATING COPPER-BALL ACCELEROMETERS, by V. F, DeVost and G. Stathopoulos. 10 Apr 59, 38p. 5 refs. NAVORD rept. 6204; AD-219 368.
Order from LC mi$3.00, ph$6.30 PB 147 604

Several inertia-actuated discriminator mechanisms were incorporated into the NOL copper-ball accelerometer design. The discriminators are used where several shock pulses occur in close time sequence and where it is desired to measure the maximum acceleration of one pulse or a portion of a pulse while discriminating against shocks incidentally present. This report describes briefly the NOL copper-ball accelerometers and presents information and drawings on the discriminator modifications. (Author)

Naval Ordnance Lab., White Oak, Md.
THE EFFECT OF DIFFERENT AMINES ON THE MECHANISMS OF CURE OF EPOXY RESINS AND EXPLOSIVE COMPATIBILITY, by Hugh C. Anderson. 16 Dec 57, 22p. 9 refs. NAVORD rept. 6023; AD-158 532.
Order from LC mi$2.70, ph$4.80 PB 146 470

The causes of the generally adverse effects of amine cured epoxy resins on explosives were investigated. The effects of four structurally different amines on percentage epoxy conversion, degree of crosslinking and compatibility of the cured products with HBX-1 were studied.

Naval Ordnance Lab., White Oak, Md.
GRAVITY-SENSITIVE COMPONENT SHOCK TESTER, by V. F. DeVost and G. Stathopoulos. 27 Aug 58, 23p. 5 refs. NAVORD rept. 5779; AD-206 792.
Order from LC mi$3.00, ph$6.30 PB 147 568

This report describes a shock tester developed at the NOL for evaluating gravity-sensitive, inertia-operated devices. The machine is designed to accelerate light test components at any desired angle while mounted in their normal orientation with respect to the earth's gravitational field. The tester essentially consists of a seismically suspended carriage to which the test component is mounted and an air driven hammer which strikes the carriage. Accelerations of 2 to 50 g and velocity changes of 0.25 to 15 fps can be obtained by varying the air pressure. Shock durations of 2 to 50 milliseconds can be obtained by varying the material and shape of the hammer impacting surface. The report also discusses the machine's advantages, limitations, and applications, includes machine drawings, and presents information on inertia sensitivity concepts. (Author)

Naval Ordnance Lab., White Oak, Md.
NOL COPPER-BALL ACCELEROMETERS, by G. Stathopoulos and V. F. DeVost. 6 May 59, 13p. 4 refs. NAVORD rept. 6638; AD-216 096.
Order from LC mi$2.40, ph$3.30 PB 147 605

This report describes the copper-ball accelerometers currently in use at the Naval Ordnance Laboratory. The principle of operation of this instrument as a peak reading accelerometer is discussed as well as its use as a velocity pickup. Discriminator modifications that permit programing the recording period of the gage to preclude recording multiple impacts are presented. (Author) (See also PB 147 660)

Naval Ordnance Test Station, China Lake, Calif.
AN EVALUATION OF LEAK-DETECTION METHODS, by Robert H, Martin and Wm. C. Shaw. 15 Oct 58, 36p. 12 refs. NOTS 1993; NAVORD rept. 5868; AD-206 622.
Order from LC mi$3.00, ph$6.30 PB 149 821

This report released for sale to the public 25 Aug 60.

The following industrial techniques for finding and measuring small leaks are described: bubble methods, volume-sharing method, and halogen, radioactive, and helium tracers. The use of the helium leak detector is discussed in detail as it was found to be the most suitable for working with small, sealed items of ordnance. (Author)

Naval Ordnance Test Station, China Lake, Calif.
PROPOSAL FOR A SIMPLE SYSTEM FOR ACHIEVING SOFT LANDING OF A ROCKET VEHICLE, by Charles E. Hendrix. 8 June 60, 17p. 4 refs. NOTS TP-2495; NAVWEPS rept. 7084.
Order from LC mi$2.40, ph$3.30 PB 148 964

A simple optical system has been proposed for terminal guidance of a soft-landing rocket vehicle. Working on the apparent motion of objects on the

ground through the field of view, the system requires no specific targets, but only natural surface contrast. The system can be used to provide information on both deceleration and attitude stabilization. Deceleration is to be achieved with a NOTS-developed variable-thrust rocket motor, the use of which greatly simplifies the control problem. The system is not limited to vacuum conditions, but can work on any planetary surface, whether or not there is an atmosphere. (Author)

Naval Postgraduate School [Monterey, Calif.]
THE EFFECT OF EXPLOSIVE MIXTURES UPON IMPACT SENSITIVITY, by James Edward Sinclair. Mar 57, 32p. 6 refs. Technical rept. no. 16.
Order from LC mi$3.00, ph$6.30 PB 150 151

This report released for sale to the public 12 Sep 60.

The measurement of the impact sensitivity of two explosive systems TNB-TNB and TNT-PETN has been studied along with relevant factors affecting this sensitivity. The effects of sample size, dilution with inert material, and active mixtures have been explored and a "rule-of-thumb" formula suggested as an index of the reliability of a particular explosive or explosive mixture. (Author)

Naval Research Lab., Washington, D. C.
SATELLITE LAUNCHING TRAJECTORY CALCULATIONS: A MULTISTAGE, TWO-DIMENSIONAL, ZERO-LIFT PROGRAM FOR NAREC, by J. L. Hammersmith. Interim rept. 20 June 60, 6p. NRL rept. 5512.
Order from LC mi$1.80, ph$1.80 PB 147 834

Because all programs were done in basic NAREC coding, which allows only fixed point arithmetic, the formulas for apogee calculations were rescaled to permit greater distances and higher velocities. The procedure used to select suitable trajectories in some of the programs frequently collapsed when they were used for vehicles radically different from Vanguard, resulting in considerable loss of time. The program described in this report was constructed with many features which render it more efficient in such cases.

Naval School of Aviation Medicine, Pensacola, Fla.
A NOTE ON THE GRAVITY-FREE STATE ON A SPACE PLATFORM, by Hermann J. Schaefer. 29 Jan 59, 31p. 1 ref. Proj. NM 17 01 11, R-48; AD-213 439.
Order from LC mi$3.00, ph$6.30 PB 146 680

Through the use of a concrete example of intersatellite transportation, the dynamics and kinetics of such motions are analyzed in a simplified way. If the satellite is assumed to maintain attitude in space and if the free motions are described in a coordinate system at rest to the satellite, it is found that these motions are rectilinear and of constant speed during an initial period which, for an earth circling vehicle at 500 kilometers altitude, equals five minutes. Thereafter, the apparent motion follows a complicated circular or spiral pattern depending on the direction of the initial speed. Two limiting cases, the "forward" and the "upward" throw of an object from the satellite, are analyzed in more detail. A consequence of more general interest of these relationships is the known fact that it is not possible to put a loose assembly of parts or objects in orbit so that they maintain their original array. As their respective centers of gravity will have slightly different distances from the center of the earth, they will start spreading as soon as they are set free. On the other side, only very small conservative forces are required to keep even very "heavy" objects aligned.

Naval Weapons Lab., Dahlgren, Va.
EXTERIOR BALLISTIC DATA FOR THE 56-LB PRACTICE BOMB MK 89 MOD O WITHOUT SUSPENSION LUGS EJECTED FROM THE AERO 8A PRACTICE BOMB CONTAINER IN THE A3D-1 AIRPLANE IN HORIZONTAL FLIGHT, by J. D. Kunlo. 17 June 60, 22p. 4 refs. NWL rept. no. 1708.
Order from LC mi$2.70, ph$4.80 PB 149 160

From an analysis of the test results it is concluded that (1) the observed dispersions of the Mk 89 Mod O without suspension lugs are acceptable, and (2) the ballistic table OP 2787 is applicable to the subject bomb when ejected from the Aero 8A practice bomb container in the bomb bay of A3D aircraft in horizontal release maneuvers up to 10,000 feet altitude and 510 knots true airspeed. Moreover, it is believed that, in view of the satisfactory flight characteristics, OP 2787 will be applicable to the Mk 89 bomb when released at altitudes up to 70,000 feet and at subsonic airspeeds. (Author)

Oklahoma State U. Research Foundation, Stillwater.
AEROBEE RANGE SAFETY EQUIPMENT, by Oscar L Cooper. Scientific rept. no. 1 on Contract AF 19(604)2029. 1 Mar 60, 44p. AFCRC TN-60-280; AD-234 050.
Order from LC mi$3.30, ph$7.80 PB 146 465

The equipment, usually called a Range Safety Package, is built to be contained in a standard 10-inch Aerobee extension. It will accommodate an AN/DRW-3, AN/DRW-11 or an AN/DRW-13 command receiver for rocket fuel-cut-off. It also carries an S-Band radar beacon transponder such as the AN/DPN-19 or the AN/DPN-41 with their power supplies. A pair of S-Band Quadraloop antennas is mounted diametrically on the surface of the 10-inch extension. A removable battery access door is mounted on the side of the extension to facilitate battery changes without rocket disassembly.

[Pacific] Missile [Range] Port Mugu, Calif.
KAN-2 (LITTLE JOE) by Ken Mattson. Rept. on TED Proj. PAU 1804. 25 Mar 47, declassified 12 June 56, 45p. Technical rept. no. 10.
Order from LC mi$3.30, ph$7.80 PB 148 623

The test program has succeeded in testing the telemetering system under development as well as providing training of personnel in the testing of pilotless aircraft of this type. LITTLE JOE has been used to advantage in testing internal components of pilotless aircraft and, with a modified aerodynamic design, this missile could be a cheap, simple solution to a test vehicle for development of Pilotness Aircraft components.

Picatinny Research Center, Picatinny Arsenal, Dover, N. J.
THE USE OF CARBON-14 AS A TRACER TO STUDY THE ORIGIN OF TETRANITROMETHANE IN TNT MANUFACTURE, by Frederick S. Holahan, Thomas C. Castorina and others. July 60, 25p. 28 refs. Technical rept. 2695.
Order from LC mi$2.70, ph$4.80 PB 148 304

During the production of TNT, a small amount of tetranitromethane (TNM) forms as a by-product. The purpose of this study was to determine the origin of TNM in this reaction, using carbon-14 as a tracer. TNM is known to form during the trinitration step. It was found that most of the TNM originates from the aromatic ring carbons, with over 50% being contributed by the ring carbon attached to the methyl group of DNT. It was also found that over 80% of all the TNM can be traced to the DNT isomers derived from m-nitrotoluene. From the extent to which each of these compounds contributed to TNM formation, their relative rates of nitration were postulated. The ultimate formation of TNM is attributed to the DNT oxidation reaction in competition with that of nitration. (Author)

Rock Island Arsenal Lab., Ill.
FINGERPRINT NEUTRALIZING COMPOUNDS. V. PREPARATION OF A FORMULATION WITH MAXIMUM SPEED OF FINGERPRINT REMOVAL, by F. Blessin. 4 May 50, 41p. Rept. no. 50-750.
Order from LC mi$3.30, ph$7.80 PB 149 770

This report released for sale to the public 25 Aug 60.

Results of tests previously conducted are presented to illustrate the effect of increased water content in improving the removal efficiency of certain fingerprint removers. Two different methods of systematically determining the optimum composition as regards water content of triethanolamine oleate solubilized fingerprint remover formulations are presented and the results obtained by the two methods are compared. The various base formulations and the optimum solutions derived therefrom were prepared with amounts of water near the maximum tolerance and used for testing the speed of removal of fingerprint residues. (Engineering--Ordnance, 18 Nov 60)

Rome Air Development Center, Griffiss AFB, N. Y.
ON THE POSSIBILITY OF SPACE SURVEILLANCE VIA A 24-HOUR SATELLITE, by Joel S. Greenberg. Mar 60, 21p. 10 refs. RADC TN-60-9; AD-234 381.
Order from LC mi$2.70, ph$4.80 PB 147 805

A brief discussion is given of the possibility of utilizing a 24-hour satellite in a space surveillance system. The power requirements of a typical system configuration are investigated and discussed in terms of integration time (coherent versus noncoherent integration), transmitter beamwidth, frequency, and echo area. (Author)

Systems Development Labs., Hughes Aircraft Co., Culver City, Calif.
CREEP BUCKLING OF CYLINDRICAL SHELLS IN AXIAL COMPRESSION, by J. M. Bozajian and C. H. Tsao. Rept. on Contracts AF 33(038)28634 and AF 33(600)28438. 24 Jan 58, 35p. 5 refs. SRSM7-196; AD-158 651.
Order from LC mi$3.00, ph$6.30 PB 150 287

This report released for sale to the public 19 Sep 60.

Tests have been made of 56 QQ-M-44H magnesium alloy circular cylinders in axial compression. The test temperatures ranged from 75° F to 600° F and the loading program included stresses increasing linearly with time in addition to constant stresses. A semiempirical formula was obtained which correlates, through the use of basic elastic and creep properties, the buckling stress and time as influenced by temperature and the stress history in the ranges tested. The statistical variation of the data as correlated has been used to establish allowable buckling stresses of the material used in GAR-3/GAR-4 Falcon missile fuselages as a function of desired probability of failure. The buckling correlation equation has been expressed in terms of the elastic and generalized scant moduli of the cylinder material and has been used to predict creep buckling stresses for other materials. Methods of applying these results to creep buckling under transient stress and temperature conditions have been analyzed. (Author)

Watertown Arsenal Labs., Mass.
INFLUENCE OF CRACK WIDTH AND DEPTH ON MAGNETIC FLUX LEAKAGE FIELDS, by Patrick C. McEleney. Aug 60, 17p. 3 refs. Technical rept. no. WAL TR 148.1/2.
Order from LC mi$2.40, ph$3.30 PB 148 920

The depth of a crack is shown to be the major factor contributing to the amplitude of an induced signal in a pickup coil scanning a magnetized specimen. However, the magnitude of the contribution due to width variations is large enough to cause spread in data in voltage versus crack depth graphs. More refined techniques of signal analysis and a more accurate determination of the distribution of magnetic flux about discontinuities are required to improve the precision of measurement of crack depth by the magneto-inductive method. (Author)

Sanitation and Safety Engineering

Naval Civil Engineering Lab., Port Heuneme, Calif.
FOG FOR MOBILE FIRE APPARATUS, by John J. Bayles and Robert E. Jochums. 9 Mar 60, 53p. Technical Compilation C-002; AD-234 877.
Order from LC mi$3.60, ph$9.30 PB 147 811

A literature survey was conducted by the Laboratory to determine the optimum desired characteristics of water fog in fire fighting and to establish requirements for fog nozzles and fog guns. This study revealed that: (1) fog is now considered a basic tool in fire fighting, essential in efficiently fighting structural and brush-grass fires with mobile fire apparatus; (2) there is also a definite need for the availability of solid streams of water for specific situations encountered in fire fighting; (3) there is a need for both high-pressure and low-pressure pumping systems; and (4) there is a need for a variety of fog patterns for fire fighting.

Naval Civil Engineering Lab., Port Hueneme, Calif.
A PACKAGED FIRE SPRINKLER SYSTEM FOR ADVANCED BASE BUILDINGS, by R. J. Zablodil, C. R. Hoffman, and R. S. Chapler. Interim rept. 18 Feb 60, 38p. 2 refs. Technical rept. 067; AD-234 878.
Order from LC mi$3.00, ph$6.30 PB 146 970

The fire sprinkler system was developed to protect the standard 20 ft x 48 ft advanced base building. It has a 370 gal storage tank, a rectangular, 12-headed sprinkler loop, and associated valves and fittings. The system is dry and starts automatically when supervisory pressure maintained in the loop is lost. Pressure loss opens the pilot operated main nitrogen valve to pressurize the storage tank from two high pressure nitrogen cylinders. Five tests, one each with 1, 3, 6, 9, and 12 heads open, were made at 70 F, using water as the extinguishant, and all five were satisfactory. Flow rates varied from 12 gpm with one head open to 70 gpm with all 12 heads open, and operating time varied from a minimum of 5 min to a maximum of 30 minutes. Three tests were made at -65F on the nitrogen pressurization portion alone. Satisfactory performance was obtained with regulated pressure approximately twice that of the 70 F tests. The nitrogen pressurization components should be improved for low temperature application, and a prototype sprinkler system should be fabricated and field tested in the arctic. (Author)

Technical Development Labs., Dept. of Health, Education, and Welfare, Savannah, Ga.
COMPOSTING OF ORGANIC WASTES: AN ANNOTATED BIBLIOGRAPHY, by John S. Wiley. Feb 58, 126p. 145 refs.
Order from LC mi$6.30, ph$19.80 PB 147 219

This bibliography, with abstracts and occasional editorial remarks, may serve as a source of information for those interested in the subject. The subject matter is limited to composting which may be defined as a process in which microorganisms break down organic matter to a relatively stable humus-like material. Most of the references deal with actual or attempted aerobic thermophilic decomposition. They also deal largely with the composting of municipal refuse or garbage, sometimes with additional materials such as sewage sludge, night soil, or manure. Studies at Michigan State University and the CDC Technical Development Laboratories indicate that de-watered garbage or refuse can be composted through one cycle of decomposition in mechanical units in an appreciably shorter time, perhaps a week or less. A few cities, notably San Diego and Tacoma, have studied composting in pilot plants. The pilot plant at Chandler, Arizona, operated by the CDC Phoenix Field Station is now supplying "know-how" and cost data on the preliminary materials handling of refuse and on outdoor composting. Engineers and municipal officials should know reasonably soon if that type of composting is an approved, competitive method for the treatment of community solid wastes in that area. The composting studies conducted at the CDC Technical Development Laboratories should lead to design and operational improvements in high-rate mechanical composters for treating community solid wastes in the United States.

Technical Development Labs., Dept. of Health, Education, and Welfare, Savannah, Ga.
COMPOSTING OF ORGANIC WASTES: AN ANNOTATED BIBLIOGRAPHY, SUPPLEMENT 1, by John S. Wiley. June 59, 66p. 141 refs.
Order from LC mi$3.90, ph$10.80 PB 147 220

See also PB 147 219

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

Aerojet-[General] Corp., Azusa, Calif.
RESULTS OF CERTAIN EXPERIMENTS ON CONVENTIONAL PULSE-JETS AND RELATED DEVICES, by W. P. Berggren, Winthrop K. Coxe and G. McRoberts. Final rept. as of 30 June 46 on Contract NOa(s) 7968, Task 9. 25 July 46, declassified 26 Oct 56. 29p. 1 ref. Rept. no. R-67; ATI-9819.
Order from LC mi$2.70, ep$6.30 PB 150 158

This report released for sale to the public 13 Sep 60.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
ANALYSIS, PERFORMANCE TESTS AND COMPUTER SIMULATION OF A 100 KW ENGINE-GENERATOR SET. Rept. on Contract DA 44-009-ENG-3214. July 58, 121p. 22 refs. AD-215 473.
Order from LC mi$6.30, ph$19.80 PB 149 254

Dynamic equations for a 100 KW engine-generator set supplying an isolated, balanced load are derived. The performance of the set composed of diesel engine, load-sensing governor, synchronous generator, and magnetic amplifier exciter was studied in the laboratory and test results are presented. Analog computer simulations for the speed governor loop and voltage regulation loop are given together with a computer representation of the complete engine-generator system. Performance tests and computer results are compared and discussed. (Author)

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
A SURVEY OF THE BASIC SCIENTIFIC PROBLEMS ASSOCIATED WITH THE BEHAVIOR OF MATERIALS AT HIGH TEMPERATURES, by A. A. Westenberg. Rept. on Contract NOrd-7386. June 59, 183p. 245 refs. TG-333-1; AD-219 986.
Order from LC mi$8.40, ep$30.30 PB 150 155

This report released for sale to the public 12 Sep 60.

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Propellant chemistry, thermodynamics, and high-temperature material properties

Borg-Warner Corp., Chicago, Ill.
PULSED PLASMA PROPULSION. AN ADVANCED REACTION SPACE PROPULSION SYSTEM. SUMMARY OF LITERATURE SURVEY, by Thomas L. Thourson. Rept. on Contract AF 33(616)6036. Apr 59, 132p. 276 refs. WADC Technical rept. 59-194; AD-213 838.
Order from LC mi$6.90, ph$21.30 PB 150 150

This report released for sale to the public 12 Sep 60.

A summary is presented of a literature survey on pulsed plasma propulsion, an advanced space propulsion system. Included is a discussion of experimental and analytical investigations of various pulsed plasma propulsion schemes. Other topics included are: (a) competitive propulsion systems, (b) studies in plasma physics, (c) studies in electric breakdown phenomena, and (d) experimental and diagnostic techniques applicable to the study of plasma physics. A bibliography is appended. (Author)

Convair, Fort Worth, Tex.
A NUCLEAR GROUND SUPPORT EXPERIMENT WITH QUICK DISCONNECT DEVICES, by P. L. Marjon. Rept. on Contract AF 33(600)32054. 29 June 59, 25p. 3 refs. NARF-59-24T; MR-N-247; AD-219 379.
Order from LC mi$2.70, ph$4.80 PB 149 992

This report released for sale to the public 31 Aug 60.

An experiment in remote handling was conducted to provide information on equipment needs for ground support of nuclear aircraft. Representative, commercially available components with quick-operation features were used in remote handling tests. An evaluation was made of the caused of difficulties encountered in remote operations. Recommendations are made to guide the design of handling equipment for nuclear airplane maintenance applications. (Author)

Cross-Malaker Labs., Inc., Mountainside, N. J.
KINETIC STUDY OF ROCKET EXHAUST GASES, by Richard A. Rossi and John Feduchak. Progress rept. no. 1 on Contract DA 30-069-ORD-2918. June 60, 69p. 233 refs. Rept. no. CM-103-1.
Order from LC mi$3.90, ph$10.80 PB 149 568

Forschungsinstitut für Physik der Strahlantriebe e. v., Stuttgart (West Germany).
THE THERMODYNAMIC PROPERTIES OF HYDROGEN AND WATER AS POSSIBLE WORKING FLUIDS FOR NUCLEAR ROCKETS, by I. Sänger-Bredt. Rept. on Contract AF 61(514)910. May 58, 52p. 22 refs. AFOSR-TR-58-87; AD-162 108.
Order from LC mi$3.60, ph$9.30 PB 150 159

This report released for sale to the public 1 Sep 60.

Contents:
Notion and function of a working fluid in rocket power planes
The heating of hydrogen, respectively water, at constant pressure and under equilibrium conditions, as well as attainable flow velocities in the end of the expansion nozzle
First comparative analysis of other possible working fluids, particular of hydrogen compounds of light elements
Heat transfers of hydrogen, water, and helium, to the interior walls of the combustion chamber under equilibrium conditions
The influence of nonequilibrium processes on the values of exhaust velocities and heat transfer, as well as on the qualification of the different working fluids

Jet Propulsion Center, Purdue U., Lafayette, Ind.
ON THE IMPORTANCE OF COMBUSTION CHAMBER GEOMETRY IN HIGH FREQUENCY OSCILLATIONS IN ROCKET MOTORS, by J. R. Osborn and J. M. Bonnell. Rept. on Contract AF 49(638)756. May 60, 18p. 7 refs. AFOSR-TN-60-393. AD-237 692.
Order from LC mi$2.40, ph$3.30 PB 148 235

The experiments reported herein were concerned with the determination of some of the underlying factors which contribute to the occurrence of transverse modes of combustion pressure oscillation in rocket motors. Two rocket motors having different diameters and several different lengths were employed in the experiments using a gaseous hydrocarbon fuel and air as propellants. The investigation indicated that changes in the aspect ratio and volume of the rocket motor combustion chamber has a profound effect on the incidence and amplitude of the transverse modes. These effects were modified by interactions of the transverse modes with the longitudinal mode. The transverse modes present in the experiments were determined to be the "spinning" and the radial modes. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
FUNDAMENTALS OF SOLID ROCKET PROPULSION, by Henry Tao-Sze Hsi. Technical memo. Jan 60, 49p. 6 refs. LMSD-288134.
Order from OTS $1.25 PB 161 907

The subjects treated are the basic theories and equations in dynamics and thermodynamics of rocket propulsion; rocket missiles in flight, and velocity and trajectory problems; and background theory and operation of solid-propellant rocket units. A glossary of terms commonly used in solid-propellant rocketry can be found in the appendix. (Author)

Naval Ordnance Test Station, China Lake, Calif.
A METHOD FOR DETERMINING VELOCITY BY COMBINING POSITION AND ACCELERATION DATA TAKEN ON THE SNORT TRACK, by Prescott D. Crout. 28 Mar 60, 59p. 2 refs. NOTS TP 2474; NAVWEPS rept. 7069.
Order from LC mi$3.60, ph$9.30 PB 149 153

A method of combining accelerometer and track-coil data to obtain velocity data using Lagrange polynomials is described. An error analysis shows that under most conditions an RMS of less than 0.1 fps over a velocity range of 200 to 2,000 fps is possible. (Author)

Reaction Motors Div., Thiokol Chemical Corp., Denville, N. J.
HEAVY PARTICLE PROPULSION RESEARCH, by Douglas M. Jamba. Rept. for 1 Jan-30 Apr 60 on Contract AF 49(638)657 and ARPA Order 6-58, Task 8. [1960] 38p. 3 refs. Rept. RMD-1155-S3; AFOSR-TR-60-[79].
Order from LC mi$3.00, ph$6.30 PB 149 903

The work is concerned with the generation, charging and acceleration of multi-atom particles to determine the characteristics of particle beams as they may apply to advanced electric propulsion systems. Major efforts have been concerned with the handling of previously prepared fine powders. Many types of mechanisms were tested to charge, hold and feed these solid metal particles with the end purpose of obtaining a continuous beam of charged particles having an average specific charge in the range of 1 to 100 coulombs per kilogram. Several measurement systems and techniques were investigated to determine their advantages and limitations. No one system was found that could be used for general comparison and evaluation of charged particle beam properties. (See also PB 147 519)

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
PRESSURE RECOVERY OF A FREE JET SUPERSONIC WIND TUNNEL WITH SHROUD DIFFUSER FOR TESTING AIR BREATHING ENGINES, by W. L. Melnick and R. Hermann. Rept. on Contract AF 49(600)713. July 59, 47p. 17 refs. AEDC-TN-59-71; AD-218 184.
Order from LC mi$3.30, ph$7.80 PB 147 574

The flow process in a shroud diffuser is investigated by means of a one-dimensional analysis that treats the flow between nozzle exit and diffuser entrance as a free jet. The effects of cowl drag and control of the test chamber pressure by means of mass inbleed or suction are included in the analysis. An exact solution of the equations of conservation of mass, momentum and energy for steady, inviscid, one-dimensional flow indicates the existence of two possible states after recapture of the flow in the shroud. In general, the flow will be subsonic after recapture; for suitable operating conditions, the flow can be supersonic. A phenomonological model of the flow process is formulated for the supersonic state. The operating conditions for optimum pressure recovery are reviewed for both cases. (Author)

Wiancko Engineering Co., Pasadena, Calif.
ACOUSTIC IMPEDANCE MEASUREMENTS FOR PROPULSION SYSTEM COMPONENTS, by C. L. Dailey, A. C. Brown, and J. W. Headley. Rept. on Contract NOas-58-565-c. July 59, 88p. 4 refs. Rept. no. W2328-F; AD-225 648.
Order from LC mi$4.80, ep$15.30 PB 150 156

This report released for sale to the public 12 Sep 60.

The concept of acoustic impedance is reviewed which is employed by acousticians in describing the boundary conditions relating pressure and velocity disturbance at some station in a distributed acoustic region. The concept is applied in formulating an analytical discription of a complete propulsion system in which experimentally determined functions are used. The acoustic impedances of a diffuser and engine from a specific airplane were measured, and the response of the duct system to a rapid transient in flight was computed. The airplane was flown, and the predicted data were compared with the experimental results. The tests showed that direct measurement of acoustic impedance is practical and that the acoustic system is linear over the range of amplitudes required for the measurement, i.e. the determined impedances do not depend on amplitude of the disturbance signal.

Manufacturing Equipment and Processes

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
STUDY OF THE WELDABILITY OF A MODIFIED HOT WORK DIE STEEL, by W. A. Sipes and E. J. Fogarty. Rept. on Proj. TED NAM AE 4426, Pt. 4. 9 Apr 59, 28p. Rept. no. NAMC-AML-AE-1083; AD-228 996.
Order from LC mi$2.70, ph$4.80 PB 149 316

A limited study of the weldability of a typical modified hot work die steel of the AISI H-11 type was made. Satisfactory joints were produced utilizing an experimental coated, low hydrogen electrode. The strength levels of the welded joints approached 300,000 psi after suitable heat treatment. Joint efficiencies approximating 100% were readily obtained. (Author)

Aeroprojects, Inc., West Chester, Pa.
FUNDAMENTALS OF ULTRASONIC WELDING. Bimonthly rept. no. 2, Dec 57-Jan 58, on Contract NOas-58-108-c. Feb 58, 35p. 9 refs. AD-161 344.
Order from LC mi$3.00, ep$7.80 PB 150 085

This report released for sale to the public 31 Aug 60.

Stress distribution in the weld zone: Three types of photoelastic models are discussed; (1) plank models,

(2) frozen-stress models, and (3) direct-observation triaxially restrained models. Energy delivered to the weld zone: A physics experiment was devised and instrumentation is being assembled to correlate oscillograph patterns with the standing-wave ratio associated with essentially zero power delivery by, and with about 100% power delivery through, an acoustical conductor. Energy transmitted through the weld zone: An experiment was devised to correlated weld strength with the signal produced during welding by a reflector anvil equipped with barium titanate microphonic elements. Temperature developed in the weld zone: Two techniques were used to determine temperatures: (1) by recording thermal emfs obtained from a junction consisting of the weldment and a single wire previously inserted or potted into the zone of the intended welds, and (2) by metallographic studies. Properties of materials being welded: A preliminary experiment is being statistically designed to investigate the relation of certain material properties to vibratory weldability. Initial consideration is being given to hardness, thermal properties, and recrystallization.

Aeroprojects, Inc., West Chester, Pa.
FUNDAMENTALS OF ULTRASONIC WELDING. Bimonthly rept. no. 3, Feb-Mar 58, on Contract NOas-58-108-c. Apr 58, 24p. 14 refs. AD-205 394.
Order from LC mi$2.70, ep$6.30 PB 150 080

This report released for sale to the public 31 Aug 60.

Stress distribution in the weld zone: the direct-observation triaxially restrained model (DOTRM), supplemented by the simple plank model, shows promise as a preliminary means of observing stress distributions. Energy delivered to the weld zone: Instrumentation is being developed for SWR measurement in a primary component of the elastic vibration coupling system which would provide means for determining the net power delivered to the weld zone. Energy transmitted through the weld zone: High response oscillography was used to obtain data from microphone elements attached to the reflector sonotrode during the formation of ultrasonic welds. The reflector-sonotrode system was intimately connected with the materials welded (2024-T3 Alclad, 1100-H4 Al, C.P. Cu, and Armco ingot iron), the operating variable of force and power, and the energy delivered to the weld zone. Temperature developed in the weld zone: The single-wire-thermocouple technique was utilized at 4 clamping force levels and 4 power levels to explore the temperature rise associated with ultrasonically welding (1) half-hard commercial purity Cu (0.032-in. thick) to itself, (2) 1100-H4 Al (0.032-in. thick) to itself, and (3) Armco ingot iron (0.028-in. thick) to itself. Properties of materials being welded: The effects of temperature rise, material thickness, and difficulties of energy measurement associated with ultrasonic welding are discussed. (See also PB 150 085)

Aeroprojects, Inc., West Chester, Pa.
ULTRASONIC WELDING OF STRUCTURAL ALUMINUM ALLOYS. Bimonthly rept. no. 4, 21 July-20 Sep 57, on Contract NOas-57-480-c. Sep 57, 11p. AD-161 151.
Order from LC mi$2.50, ep$4.80 PB 150 083

This report released for sale to the public 31 Aug 60.

Control of weld quality: A more sensitive quality control test (AD-142 657) was initiated, but with 0.040-in. 2024-T3 bare Al alloy welded at 2400 effective w, 700-lb clamping force, and 1.5 sec welding time. Influence of vibratory direction on weld strength: Shear tests were devised for symmetric loading of single-lap specimen. Test results indicated that no preferential orientation exists. Validity of data for structural applications: No consistent trend for tab or panel weldments was developed. Extending capability of spot-type welding equipment: The use of an interleaf of 0.001-in. 1100-0 Al between 0.050-in. sheets of 2024-T3 bare Al alloy nearly doubled the strength of the welds in this material. Ultrasonic roller welding equipment: The brush-slip system design was revised and new parts are being fabricated and installed. (See also PB 150 080)

Aeroprojects, Inc., West Chester, Pa.
FUNDAMENTALS OF ULTRASONIC WELDING. Bimonthly rept. no. 6, Aug-Sep 58 on Contract NOas-58-108-c. Oct 58, 17p. 9 refs. AD-209 993.
Order from LC mi$2.40, ep$4.80 PB 150 078

This report released for sale to the public 31 Aug 60.

Temperature developed in the weld zone: Interface temperatures in 0.032-in. Armco iron were measured by means of the single-wire-thermocouple and meltable-wire-insert techniques. Properties of materials being welded: Acoustic power vs sheet thickness data were obtained for several foil gages of half-hard Cu and AISI 302 stainless steel to establish the minimum electric power required to accomplish a weld. Weld interface distrubance: Autoradiographs displayed high densities ad acent to the surface of radioactive foil insert in several areas of the weld. This darkening of the photographic emulsion was attributed to subsurface radiation. (See also PB 150 084)

Aeroprojects, Inc., West Chester, Pa.
ULTRASONIC WELDING OF STRUCTURAL ALUMINUM. Bimonthly rept. no. 5, 21 Sep-20 Nov 57, on Contract NOas-57-480-c. Nov 57, 13p. 4 refs. AD-161 343.
Order from LC mi$2.40, ep$4.80 PB 150 084

This report released for sale to the public 31 Aug 60.

Control of weld quality: Weld strength test data are presented for 0.040-in. 2024-T3 bare Al alloy which indicate that ultrasonic welds are reproducible and that quality control is not difficult to obtain. Extending capability of spot-type welding equipment: A brief theoretical analysis was made to determine the stresses to which a transducer-coupler may be exposed. The results indicate the need for determining the standing-wave ratio in such systems if the power-handling capacity prediction is to be reasonable accurate. An experiment with foil interleaves of 1100-0 and 1100-H19 Al in various gages indicated that 0.001-in. foil generally produced stronger welds than the heavier gages. Preliminary fatigue studies: The results of studies on the preparation of fatigue test specimens indicate that at high loads ultrasonic welds are equal to and possibly better than resistance spotwelds in the same material. (See also PB 150 083)

California U., Los Angeles.
RESEARCH IN PRODUCTION SEQUENCING, by James R. Jackson. Rept. on Management Sciences Research Proj. [Contract Nonr-223(02)] 9 Oct 58, 14p. 17 refs. Research rept. no. 57.
Order from LC mi$2.40, ph$3.30 PB 148 834

An important class of industrial problems is concerned with the sequencing of production activities, as differentiated from the distribution of workloads among blocks of productive time. The relation of sequencing to workload distribution is parallel to that of job dispatching to master production scheduling. This paper provides a limited survey of analytic research in production sequencing, and a brief indication of the directions taken by some current computational studies. (Author)

Defense Metals Information Center, Battelle Memorial Center, Columbus, Ohio.
DEPARTMENT OF DEFENSE TITANIUM SHEET-ROLLING PROGRAM, by H. R. Ogden. Status rept. no. 5, 1 Jan-31 Dec 59, on Contract AF 18(600)1375. 1 June 60, 80p. 1 ref. DMIC rept. 46H.
Order from OTS $2.00 PB 151 087

Production of the heat-treatable alloys has been completed by one producer and is nearing completion by the other two producers. Three new alloys have been added to the program, Ti-7Al-12Zr, Ti-8Al-1Mo-1V, and Ti-8Al-8Zr-1(Cb+Ta). These are designed to be weldable alpha alloys with high creep strength. Phase II, the development of design data, has been started, with testing well under way. This work is being done on production-aged material by Lockheed Aircraft Corporation, Marietta, Georgia. Two of the seven Phase III contractors have completed their programs, and evaluation is well along for the other five contractors. The two companies who conducted preliminary evaluations of three alloys chose Ti-4Al-3Mo-1V as the most promising alloy for fabrication of parts. All of the Phase III programs are scheduled for completion in 1960. (Author) (See also PB 151 065)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
NEW DEVELOPMENTS IN THE WELDING OF METALS, by P. J. Rieppel. Rept. on Contract AF 18(600)1375. 24 June 60, 50p. 73 refs. DMIC rept. 131.
Order from OTS $1.25 PB 151 089

Progress being made with new methods of welding metals is described. The applications and limitations of each process are discussed, along with brief descriptions of how the process works and what has been done with it. The developments included are: (1) Fusion welding: (a) electroslag, (b) short-arc and dip-arc, (c) electron beam, (d) arc spot; (2) Resistance welding: (a) high frequency, (b) foil seam, (c) magnetic force, (d) process controls; (3) Brazing; (4) Solid-state bonding: (a) ultrasonic, (b) friction, (c) diffusion, (d) explosive; (5) Cutting and coating (plasma jet). (Author)

Naval Engineering Experiment Station, Annapolis, Md.
EVALUATION OF WELDED JOINTS BETWEEN AISI 347 STAINLESS STEEL AND 70/30 COPPER-NICKEL ALLOY TUBES UNDER THERMAL SHOCK, MARK II, by W. E. Clautice. 27 Aug 54, 27p. 1 ref. E.E.S. rept. 060088A.
Order from LC mi$2.70, ph$4.80 PB 150 289

This report released for sale to the public 19 Aug 60.

As a sequel to test work reported in Engineering Experiment Station Report 060064, further thermal shock tests were performed for another mock-up representing welded bimetallic joints uniting components in emergency heat exchangers in newly developed submarine propulsion plants. In their present state of development, they are considered unsatisfactory for use in the naval service. (Author)

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
AN IMPULSE TYPE RESISTANCE WELDER. 10 Apr 51, 7p. NEPA 1799.
Order from LC mi$1.80, ph$1.80 PB 149 996

This report released for sale to the public 31 Aug 60.

Titanium Metals Corp. of America, Toronto, Ohio.
TITANIUM SHEET ROLLING PROGRAM FOR Ti-6Al-4V AND Ti-4Al-3Mo-1V, by W. M. Parris and H. D. Kessler. Bimonthly rept. no. 11, 1 Jan-28 Feb 58, on Contract Noas-56-993-c. 28 Feb 58, 25p. AD-160 076.
Order from LC mi$2.70, ep$6.30 PB 150 082

This report released for sale to the public 31 Aug 60.

Solution treatment of the required twenty full-size Ti-6Al-4V sheets was completed. Uniformity tests on one 0.020" gage sheet showed yield strength variations from 118,000 to 132,000 psi as-solution treated and 149,000 to 160,000 psi after aging. Three additional sheets, one from each of the remaining gages, will be sectioned for uniformity studies later in the program. An additional 57 sheets of the Ti-4Al-3Mo-1V alloy were solution treated making a total of 115 sheets to data. A tentative classification system for solution treated sheets based upon transverse properties only is described. (Author)

Titanium Metals Corp. of America, Toronto, Ohio.
TITANIUM SHEET ROLLING PROGRAM FOR Ti-6Al-4V AND Ti-4Al-3Mo-1V, by W. M. Parris and H. D. Kessler. Bimonthly rept. no. 12, 1 Mar-30 Apr 58, on Contract NOas-56-993-c. 30 Apr 58, 22p. AD-201 485.
Order from LC mi$2.70, ep$6.30 PB 150 079

This report released for sale to the public 31 Aug 60.

Production of Ti-4Al-3Mo-1V sheets from the 3000-pound ingots is well along and should be virtually completed during the next report period. The transfer of the resistance heating - spray quench apparatus to the TMCA, Toronto mill facility was completed and one

sheet each of 0.125, 0.063, and 0.025" gage sheet was solution treated and sectioned for uniformity studies. Results indicated that good uniformity can be expected in 0.063" and heavier gages but that some problem may exist in lighter gages. Further studies on light gage material are in progress. An additional 32 heat treated sheets were shipped to various customers. Properties of these sheets taken from transverse and end strips are presented. (Author) (See also PB 150 082)

Machine Parts and Mechanisms

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
EXTENSION OF THE CONDUCTING SHEET ANALOGY TO EXTERNALLY PRESSURIZED GAS BEARINGS, by Lazar Licht. Rept. on Contract Nonr-2342(00). Oct 59, 15p. 3 refs. Interim rept. I-A2049-9; AD-228 300.
Order from LC mi$2.40, ph$3.30 PB 149 490

Incompressible, viscous flow in narrow passages bounded by parallel surfaces yields the 2-dimensional Laplace equation, $\nabla^2 P = 0$. The pressure field, load capacity and lubricant flow of hydrostatic oil bearings can be readily determined by means of the electric analogy of the conducting sheet. The equation $\frac{\partial}{\partial x}\left(P\frac{P}{x}\right) + \frac{\partial}{\partial y}\left(P\frac{\partial P}{\partial y}\right) = 0$ characterizes laminar, isothermal flow of gas lubricants in otherwise geometrically identical bearings. It is shown that by means of suitable change of the dependent variable the above equation can be reduced to the Laplacian form. The ensuing advantage is the extension of the conducing sheet analogy to externally pressurized thrust and journal guide bearings when the lubricant is a gas. (Author)

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
INVESTIGATION OF THE UNNOTCHED AND NOTCHED FATIGUE BEHAVIOR OF SEVERAL HEAT RESISTANT MATERIALS FOR ENGINE BOLTS, by Donald M. Forney, Jr. and Douglas Y. Wang. Rept. for Jan 58-Dec 59 on Materials Analysis and Evaluation Techniques. Feb 60, 59p. 4 refs. WADD Technical rept. 59-25; AD-236 684.
Order from OTS $1.50 PB 161 930

An investigation of the fatigue behavior of 3/8 inch engine bolts at various temperatures is described for the heat resistant alloys AMS 5735(A-286), Udimet 500, Inconel 700 and Incoloy 901. Tests were also performed under axial stress on unnotched fatigue specimens and fatigue specimens with a theoretical stress concentration factor of 3.4. The data are presented as S-N diagrams to show the effect on fatigue strength of temperature, stress concentration, stress magnitude and bolt thread rolling. The results of this investigation suggest the possibility of using fatigue test data obtained with single notched specimens to evaluate other heat resistant alloys for possible engine bolt applications thereby reducing the significant expense of fabrication of experimental lots of bolts for test. (Author)

Transport, Traction and Hoist Facilities

Computer Lab., Ordnance Tank-Automotive Command, Center Line, Mich.
DIGITAL COMPUTER PROGRAM FOR ACCELERATION PERFORMANCE, WHEELED VEHICLES, by Robert Arno. Rept. on Contract DA 20-089-ORD-39246. 9 Feb 60, 45p. Rept. no. RR-9.
Order from LC mi$3.30, ph$7.80 PB 148 391

A general computer program was written for the Electrodata 204 "Datatron" digital computer to calculate acceleration performance and related characteristics for wheeled vehicles. Vehicle performance is determined at prescribed time intervals during acceleration from standstill to maximum velocity. Other additional performance data supplied by this program are vehicle speed, distance traveled, time of travel, wheel torque, tractive effort, rolling resistance, drawbar pull, and acceleration. (Author)

Computer Lab., Ordnance Tank-Automotive Command, Center Line, Mich.
DIGITAL COMPUTER PROGRAM FOR CENTER OF GRAVITY, PRODUCT OF INERTIA, AND MOMENT OF INERTIA COMPUTATIONS, by M. Archambault. Rept. on Contract DA 20-089-ORD-39246. 7 Mar 60, 56p. Rept. no. RR-11.
Order from LC mi$3.60, ph$9.30 PB 148 392

A high speed computer program for determination of the center of gravity, product of inertia, and moment of inertia of a complete vehicle, or of individual components and major assemblies. Complete information is printed for the individual items considered. (Author)

Computer Lab., Ordnance Tank-Automotive Command, Center Line, Mich.
DIGITAL COMPUTER PROGRAM FOR TRACKED VEHICLE MOBILITY COMPUTATION, by Alexander Edwards. Rept. on Contract DA 20-089-ORD-39246. 15 Feb 60, 19p. Rept. no. RR-18.
Order from LC mi$2.40, ph$3.30 PB 148 393

A general computer program was written for the Electrodata 204 Digital Computer to provide rapid solution of tracked vehicle mobility performance as defined by the theory and procedure of Ordnance Tank-Automotive Command Land Locomotion Laboratory. (Author)

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
WHEELED VEHICLES (M135), LEAN AND FAT CLAY, 1957, by A. B. Thompson and Mary E. Smith. Rept. no. 2 on Stresses under Moving Vehicles. May 60, 71p. 2 refs. Technical rept. no. 3-545.
Order from LC mi$4.50, ph$12.30 PB 149 199

A study was conducted to determine the distribution of stresses imparted to soil by a moving, pneumatic-tired vehicle and to compare the suitability of three different types of pressure-sensing devices for meas-

uring these stresses. The effects on stresses of such variables as soil strength, tire inflation pressure, vehicle speed, acceleration, deceleration, and towing of the vehicle were investigated with the cells installed at varying depths and offsets from the line of traffic. The large (6-in. diameter), earth pressure cell was found to be the most reliable measuring device of the three used in these tests. Inaccuracy of traffic alignment, variations in wheel load, variations in soil consistency, and cell movement were concluded to have been major causes of the discrepancies in stresses recorded by the cells. Recommendations for future tests, in which these detrimental conditions would be avoided, are included. (Author)

MATERIALS

Army Transportation Environmental Operations Group [Fort Eustis, Va.]
AFTER ACTION REPORT, ANTARCTICA 1959-60. [1960] 30p.
Order from LC mi$2.70, ph$4.80 PB 149 221

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
MEASURING FIELD HANDLING AND TRANSPORTATION CONDITIONS, by Kenneth W. Bull and Carl F. Kossack (Purdue U.). Rept. for July 56-July 59 on Finishes and Materials Preservation. Feb 60, 39p. 1 ref. WADD Technical rept. 60-4, suppl. to WADC TR-56-464.
Order from OTS $1.00 PB 161 918

This study involves concealing shock recording instruments inside ordinary shipping containers and shipping the instrumented packages through normal supply channels to determine the actual heights from which packages are dropped. Based on the data given in this report, a test drop height of 21 inches is considered adequate for specifications. Further clarification is given in the report. The recorders, calibration procedure, collected data, analysis, accuracy and associated problems are discussed. Recommendations for future studies of this sort are also given. (Author)
(See also PB 121 866)

Naval Civil Engineering Lab., Port Hueneme, Calif.
CHARACTERISTICS OF CORAL MORTARS, by William R. Lorman. Final rept. 28 June 60, 310p. 20 refs. Technical rept. 041.
Order from LC mi$11.10, ph$47.10 PB 149 446

Results are presented of a comprehensive program of tests to establish the physical properties of portland cement mortars incorporating coral sands. Nearly 2,500 specimens were tested. Selected correlations led to general formulations that serve to indicate the interdependence of mortar strength, elasticity, bulk density, volume and weight change, air content, yield, and flow. (Author)

Naval Civil Engineering Lab., Port Heuneme, Calif.
STUDY OF CREEP IN CONCRETE, by John R. Keeton. 11 May 60, 65p. Technical rept. 082.
Order from LC mi$3.90, ph$10.80 PB 148 397

Various size cylindrical concrete specimens from controlled environments (20%, 50%, and 100% R. H., 73F) received sustained compressive stresses of 38% (2000 psi) and 57% (3000 psi) of ultimate compressive strength at loading time. In the size range investigated, after 175 days of loading and regardless of specimen size, creep is 5% to 10% greater in 20% R. H. than in 50% R. H. Creep in 100% R. H. is about two-thirds of that in 50% R. H. An extensive study will be undertaken to disclose mechanics of shrinkage (Author)

Naval Ordnance Lab., White Oak, Md.
RESIDUAL AND THERMAL STRESSES IN POTTING RESINS, AND THE DEVELOPMENT OF STRAIN GAGE INSTRUMENTATION FOR THEIR DETERMINATION, by R. E. Heise, Jr. 29 Aug 58, 30p. 2 refs. NAVORD rept. 5767; AD-206 317.
Order from LC mi$2.70, ph$4.80 PB 147 569

A transducer was designed to measure strains during and after potting in thermosetting casting resin. Post-cure axial strain indicated residual compressive stress 2800 psi. Bending strains indicated little radial stress. The potted transducer was heated to 160°F and stress was relieved but recovered on cooling; then cooled to 0°F resulting in axial compressive stress 8600 psi. Thermal shock -65°F produced axial compressive stress 12,600 psi. Production of stress was direct result of thermal gradient across resin in early stage and later of different expansion coefficients for resin and transducer. (Author)

Office of Defense Research and Engineering, Washington, D. C.
SUMMARY OF RECOMMENDATIONS FOR RESEARCH AND DEVELOPMENT IN MATERIALS. 1 July 60, 56p.
Order from OTS $1.50 PB 161 865

This document constitutes a review of the many recommendations in the following areas: Materials: iron and steel; heavy nonferrous metals (refractory metals); graphite; ceramic materials; rare earths; plastics, elastomers, and fabrics; semiconductors and thermoelectric materials; intermetallic compounds. Materials Systems: ultrapure materials; composite materials; particle-hardening systems; sandwich construction; coatings. Qualities of Materials: brittleness; heat-engineered structures; lightness; high-temperature physical properties of materials; plasma phenomena. Fabrication of Materials: general; forming of metals; casting of metals; metal stock removal; welding and brazing of metals or of metals with ceramics; adhesive bonding; heat treatment of metals; fasteners. General Recommendations: deterioration of materials and structures; engineering guidance and guidance studies; miscellaneous recommendations; materials research policies.

Adhesives and Sealants

Naval Civil Engineering Lab., Port Hueneme, Calif.
PARAFFIN AS A CONDUIT SEAL AGAINST BLAST PRESSURE, by H. G. Aggas. Final rept. 18 Feb 60, 12p. Technical rept. 074; AD-234 940.
Order from LC mi$2.40, ph$3.30 PB 147 813

The blast resistance of paraffin as a sealing compound in Crouse-Hinds explosion-proof sealoffs was investigated. These sealoffs, which had approximately one-half of their cross-sectional area filled with standard electrical wire, were sealed with paraffin and tested in the blast simulator. Paraffin is an effective seal for resisting dynamic and static pressures to at least 150 psi at an average temperature of 68°F. The sealoffs were subjected to dynamic pressures up to 170 psi with no damage to the wax seal. (Author)

Picatinny Research Center, Picatinny Arsenal, Dover, N. J.
SYNTHESIS OF RESORCINOL-EPOXY ADHESIVE AND EVALUATION OF ITS MECHANICAL PROPERTIES, by Hsueh T. Lee, Eileen R. Swick, and Michael J. Bodnar. July 60, 10p. 2 refs. Technical Notes no. 51.
Order from OTS $0.50 PB 161 785

A resorcinol-epoxy resin was synthesized which when used as an adhesive gave shear strengths of approximately 1570 psi at 73°F and 2110 psi at 160°F. An average impact strength of 16.8 ft-lb/0.75 sq in. of bonded area was obtained at both 73° and 160°F, and 16.4 ft-lb/0.75 sq in. at -65°F when bonding steel to steel. Although a room-temperature cure can be accomplished using 8.2 parts diethylene triamine curing agent per hundred parts resin, the rise in shear strength at 160°F indicates that an elevated-temperature cure would be more effective in achieving the maximum adhesive properties of this material. (Author)

Ceramics and Refractories

Bausch and Lomb Optical Co., Rochester, N. Y.
FABRICATION OF INFRARED TRANSMITTING MATERIALS BY HOT PRESSED TECHNIQUES, by Norbert J. Kriedl, Harold C. Hafner and others. Rept. for 1 Apr 57-31 Mar 58 on Ceramic and Cermet Materials, Contract AF 33(616)5123. Oct 58, 171p. 14 refs. WADC Technical rept. 58-275; Part 1; AD-202 844.
Order from LC mi$8.10, ph$27.30 PB 150 149

This report released for sale to the public 13 Sep 60.

The fabrication of infrared transmitting materials by hot pressing techniques has been studied. BaF_2 was used as a model material. The temperatures studied ranged from 600 to 1225°C and the pressures from 1500 to 8000 psi. The equipment used to obtain these conditions is described. The effects of various hot pressing atmospheres including nitrogen, helium, argon and carbon dioxide, were investigated. A study was carried out to identify the impurities present and to study their effects. (Author)

Bjorkstein Research Labs., Inc., Madison, Wisc.
RESEARCH AND DEVELOPMENT ON REFRACTORY MATERIALS FOR GUIDED MISSILES, by W. W. Drummond, J. B. Eisen and others. Quarterly rept. no. 7 (Final) 17 Nov 52-17 Aug 54, on Contract NOrd-13484. Aug 54, 64p. 315 refs. AD-101 406.
Order from LC mi$3.90, ep$12.30 PB 150 153

This report released for sale to the public 12 Sep 60.

Contents:
Glass fibers
Composition of the glass
Coating nascent glass fiber with metals

Marquardt Aircraft Co., Van Nuys, Calif.
DEVELOPMENT AND EVALUATION OF INSULATING TYPE CERAMIC COATINGS, by E. W. Blocker, C. A. Hauck and others. Rept. for 1 Mar 58-28 Feb 59 on Ceramic and Cermet Materials, Contract AF 33(616)5441. Nov 59, 74p. WADC Technical rept. 59-102; AD-231 732.
Order from LC mi$4.50, ph$12.30 PB 149 888

This report released for sale to the public 29 Aug 60.

A metal reinforced ceramic coating system has been developed that will successfully withstand temperatures of 3500°F while providing insulative values for the supporting structure. This ceramic coating system utilizes a corrugated strip of stainless steel as the reinforcement media and phosphate bonded alumina as the refractory medium. The great advantages of a coating system of this nature, aside from high temperature resistance and thermal insulation, is the wide variety of applications wherein it can be utilized. Attempts have been made to use zirconia as the refractory grain in phosphate bounded reinforced coatings. These attempts have not been wholly successful, due mainly to the poor thermal shock resistance of zirconia. It is anticipated that this drawback can be eliminated. Several items of research equipment have been designed and built to facilitate study of the various ceramic materials used in this program. These include a differential thermal analysis setup, a high temperature modulus of rupture furnace, and a modification of the existing thermal drop apparatus. (Author)

Fuels, Lubricants, and Hydraulic Fluids

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
RESULTS OF A LABORATORY STUDY TO DETERMINE THE CORROSIVE PROPERTIES OF DRY FILM LUBRICANTS, by J. P. Cerini. 17 Aug 59, 12p. Rept. no. NAMC-AML-AE 42173, Pt. I.
Order from LC mi$2.40, ph$3.30 PB 149 320

The pH of MoS_2 powder used in the preparation of dry film lubricants can affect the corrosion characteristics of the film, when the film is in contact with a nonlubricated aluminum surface. Coating both mating surfaces with dry film lubricant provides maximum corrosion protection. The corrosion test method devised to simulate reported field conditions yielded results equivalent to those obtained in service for the one material for which service data was available. (Author)

Air Force Office of Scientific Research, Washington, D. C.
AFOSR CONTRACTORS' MEETING [NO. 2] ON COMBUSTION OF SOLID PROPELLANTS AT ATLANTIC RESEARCH CORP., ALEXANDRIA, VA., 7 - 8 JUNE 1960. [1960] 18p. 13 refs. AFOSR-TN-60-663; AD-239 150.
Order from LC mi$2.40, ph$3.30 PB 148 876

Contents:
Solid propellant ignition
Ignition of composite propellants
Theory of composite propellant burning
Combustion of laminar solid propellants
Solid propellant combustion mechanism
Decomposition, combustion and detonation of solids
Solid propellant combustion
Disturbances in burning solid propellants
Combustion instability

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
MEASUREMENT OF THE GAS VELOCITY OF SPHERICAL COMBUSTION WAVES BY THE BALLISTIC PARTICLE TRACK METHOD, by S. D. Raezer and H. L. Olsen. Rept. on Contract NOrd-7386. June 59, 25p. 6 refs. CM-952; AD AD-220 790.
Order from LC mi$2.70, ph$4.80 PB 149 190

When the temperature and density of the gas do not change and the velocity is in the Stoke's law regions, the gas velocity in a transient or wave disturbance can be calculated from its effect upon a heavy particle falling in its path. This method is used to obtain the cold gas velocity ahead of a spherical combustion wave in an effort to determine the flame speed. (Author)

Army Rocket and Guided Missile Agency, Redstone Arsenal, Ala.
TEMPERATURE GRADIENT TESTS OF INERT PROPELLANT GRAINS; DATES TESTED: 2 THRU 23 APRIL 1958, by James F. Wiedman. 29 Aug 58, 35p. Rept. no. 3M78N10; AD-202 536.
Order from LC mi$3.00, ph$6.30 PB 149 182

Six inert propellant grains having the same configuration were temperature cycled to obtain data on the temperature gradients present. The grains were placed in a temperature conditioning chamber at $0^{\circ}F$ and kept there until all thermocouples registered approximately that temperature. The grains were then transferred as quickly as possible to a chamber at $100^{\circ}F$ where they remained for 10 hr. The readings of the thermocouples within a given group were not always alike, especially those located nearest the surface of the grain. This discrepancy is probably caused by the air flow and resulting temperature gradients set up in the test chamber itself. Another cause of error is the specimen; its consistency may not be homogeneous, causing the heat conductivity to vary.

Bureau of [Naval Weapons] Washington, D. C.
STANDARD METHODS AND PROCEDURES FOR THE STRAND BURNING-RATE EVALUATION OF ROCKET PROPELLANT POWDER, by M. F. Schoeffel. 29 May 53, 13p. 8 refs. NAVORD OD 9376.
Order from LC mi$2.40, ph$3.30 PB 149 995

This report released for sale to the public 31 Aug 60

This report describes standard methods and procedures as well as special equipment and materials needed for the strand burning-rate evaluation of rocket propellant powder. This publication specifically applies to the strand-burning rate determination of double-base sheet propellant, types N-4 and N-5. It will also apply to other rocket propellant powder when specifically designated in applicable specifications.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
STORAGE OF BRAKE WHEEL CYLINDERS WITH MINERAL OIL, by C. B. Jordan. 20 Apr 60, 14p. 6 refs. Rept. no. CCL-92.
Order from OTS $0.50 PB 161 662

The object of this study was to evaluate the storage properties of mineral oils with hydraulic brake system components. Synthetic rubber brake cups compatible with mineral oils and having improved operational characteristics were used in the study. Brake cylinders were packaged with two types of mineral oil and placed in warehouse storage and simulated vehicle storage. Cylinders were inspected at one year intervals. All aluminum, tin, steel, and brass parts were in excellent condition after 3 years storage. Cast iron cylinder walls were excessively pitted. Synthetic rubber brake cups were in satisfactory condition. Natural rubber boots were cracked and deteriorated. (Author)

Coordinating Research Council, Inc., New York.
SOLUTION AND EVOLUTION OF GASES AND VAPORS IN AIRCRAFT FUELS. Rept. for 22 Mar 57-1 Jan 59 on Atlantic Research Corp., Subcontract to AF 33(616)3735. Apr 59, 165p. 11 refs. WADC Technical rept. 59-193; AD-233 936.
Order from OTS $3.00 PB 161 900

A program was undertaken to study solution and evolution rates of gases and vapors in aircraft fuels. The purpose was to establish parameters and develop theories to predict the operation of the fuel tanks of high-powered, high-altitude aircraft. The work done, which is reported herein, was largely experimental. Laboratory tanks were tested under simulated dynamic aircraft conditions. Aircraft fuels were pressurized under various gases in shaking tanks for

various fuel levels, temperatures, pressures, contaminants, shaking frequency, and shaking direction. Shaking frequency proved to be the most important variable in controlling the rate constants of solution and evolution. Not only did the rates tend to increase with increased frequency, but when the shaking frequency was in phase with the natural oscillation of the fuel, the rates increased one hundred to a thousand times. Contaminants such as fine dust which held and disbursed minute air bubbles did not affect solution but markedly increased the evolution rate. However, this effect occurred during the first evolution cycle only, corresponding to the first initial climb to high altitude. Fuel level affected the rates by affecting wave action in the tank. The rates increased with increasing amplitude and generally decreased with increase in tank size. Vertical and horizontal shaking operated similarly to increase the rates of solution and evolution. (Author)

James Forrestal Research Center, Princeton, N. J.
BURNING MECHANISM OF AMMONIUM PERCHLORATE PROPELLANTS, by M. Summerfield, G. Sutherland and others. Rept. on Project Squid, Contract Nonr-1858(25). Dec 58, 31p. 13 refs. Technical rept. PR-87-P.
Order from LC mi$3.00, ph$6.30 PB 148 820

Contents:
Part I: Structure of the burning zone of an ammonium perchlorate propellant, by G. S. Sutherland, and M. Summerfield.
Part II: Theory of burning of a composite solid propellant, by M. Summerfield.
Part III: Comparison of burning rates with theory by M. J. Webb, H. J. Taback, G. S. Sutherland, K. P. Hall, and M. Summerfield.

Phillips Petroleum Co., Bartlesville, Okla.
RADIATION FROM LABORATORY SCALE JET COMBUSTOR FLAMES, by E. C. Miller, A. E. Blake and others. Special rept. on Contract NOas-52-132-c. Oct 56, 70p. 10 refs. Research Div. rept. 1526-56R; AD-13? 244.
Order from LC mi$3.90, ph$10.80 PB 146 545

Characteristics of the energy radiated from aircraft gas turbine type combustion processes were investigated. Two paraffinic test fuels, normal heptane and isooctane, and two aromatic test fuels, benzene and toluene, were selected to obtain a wide range in hydrocarbon structure. Infrared flame emission and absorption spectra, from 1 to 15 microns in wavelength, were obtained at five different locations around the combustor. This was also done without combustion, and without fuel; to obtain fuel, and air, absorption spectra. Non-luminous flames were characterized by discontinuous radiation of molecular origin. Luminous flames were characterized by a predominance of continuous, black body type, radiation. At intermediate values of luminosity the discontinuous molecular radiation was evident, superimposed on the continuous radiation. The average transverse emissivity of the infrared spectral region for non-luminous flames was approximately 0.03; but it increased, with increasing flame luminosity, to nearly one. The transverse emissivity of the flames increased with increasing combustor pressure, but the rate varied with fuel type.

Rock Island Arsenal Lab., Ill.
A METHOD FOR ACCELERATING THE FEDERAL TEST METHOD PROCEDURE FOR DETERMINING THE MEAN HERTZ LOAD, by George P. Murphy. 8 July 60, 14p. 4 refs. Rept. no. 60-2156.
Order from LC mi$2.40, ph$3.30 PB 149 053

The test procedure is a combination of Girelli's "Compensation Line" and Nason's modification of the Mean Hertz Load procedure. The new test procedure gives Mean Hertz Load values that are on the average within 2% of the values obtained by Federal Test Method 6503. The advantage of the new procedure is that it reduces the number of runs necessary to determine the Mean Hertz Load from 20 to between 2 and 6 depending on the material tested. This is equivalent to a time savings of about 140 to 180 minutes in addition to the savings in cost of the test specimens. The procedure is applicable to both E.P. and non-E.P. oils and greases with the exception of those containing silicones. (Author)

Rock Island Arsenal Lab., Ill.
A STUDY OF THE SHELL FOUR BALL WEAR TEST VARIABLES, by G. P. Murphy. 8 July 60, 16p. 2 refs. Rept. no. 60-2154.
Order from LC mi$2.40, ph$3.30 PB 149 054

Four MIL-G-10924A "General Purpose" greases were tested under various conditions of load, time, and temperature. The results were mathematically treated and the relationship between the variables and the scar diameter determined. These relationships, which hold for tests on MIL-G-10924A greases over the following variable ranges, 2 to 50 kg. load, 27° to 150° C, 10 to 180 minutes and 600 RPM, are as follows: the scar diameter varies directly with the 0.25 power of the load, the 0.12 power of time and the 0.10 power of temperature. The exponential powers of load, time and temperature are also determined for mineral, diester, polyglycol, organic phosphate oils, and several different grease types. The general equation for conversion of data is given. This equation is applicable only to scar diameters in the nonseizure portion of the Shell Four Ball Wear Test wear curve. (Author)

Leather and Textiles

Army Engineer Research and Development Labs., Fort Belvoir, Va.
DESIGN AND RELIABILITY OF SOIL BURIAL TESTS FOR TEXTILES, by J. M. Ashcroft. 28 Aug 58, 28p. 2 refs. Rept. 1541-TR; AD-204 278.
Order from LC mi$2.70, ph$4.80 PB 147 224

The investigation was to determine the extent to which the reliability of the soil burial method as a means of evaluating rot-inhibiting treatments of textiles might be increased by an experimental design more sophisticated than the random pattern frequently employed, and to ascertain whether varying the technique used in applying a given treatment would alter significantly its effectiveness as a rot inhibitor.

Fabric Research Labs., Inc. [Dedham, Mass.]
A SURVEY OF 18 OZ. BLENDED SERGE FABRICS: STABILITY OF FABRICS TO MOISTURE AND R. H. MOVEMENT, by Normal J. Abbott, Leo Barish, and Milton M. Platt. Rept. on USAF Uniform Clothing Assemblies, Contracts DA 19-129-qm-1312; AF 33(616)54-172; AF 33(616)55-82; and AF 33(616)57-20. Oct 59, 43p. WADC Technical rept. 59-242; AD-230 982.
Order from OTS $1.25 PB 161 901

The effect of blending a number of fiber types with wool on the behavior of 18-oz. serges under extremes of humidity was studied. The blended fibers included viscose, nylon, Dacron, Orlon Acrilan, and Dynel, in amounts up to 30%. The results have shown that some differences exist between the effects of changes in humidity on the nine fabrics examined. With one exception, however, the differences were small, and it would require some practical experience with the fabrics to assess their importance. The properties studied included dimensional change, fabric deformation, seam puckering, stiffness, moisture regain, and bagging tendency. The only relatively large change in any of these properties which was brought about by changes in humidity was the rather large increase in stiffness which took place in high humidity. This has been attributed to a jamming of the structure due to the swelling of the fibers, and was apparently not related to the type of fiber which was blended with the wool. In other characteristics the differences which existed between the fabrics are sufficient to differentiate between the fibers, but in general are not considered to be of major practical importance. (Author)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
AIR PERMEABILITY OF PARACHUTE CLOTHS, by H. W. S. LaVier and W. C. Boteler. Rept. on Contract AF 33(038)15624. Apr 55, 75p. 5 refs. WADC Technical rept. 52-283, Part V.
Order from LC mi$4.50, ph$12.30 PB 149 990

This report released for sale to the public 31 Aug 60.

The air permeability evaluations of various nylon cloths produced by different manufacturers to the same MIL specifications are presented here. The effect on air permeability due to various weaving defects was investigated and it was concluded that such normal defects had little or no effect on the cloth air permeability evaluations. Variation of the magnitude of the calendering load was studied regarding its effect on air permeability of a cloth. It was found that loads up to fifty tons per inch caused considerable change in the cloth permeability. However, loads above fifty tons per inch caused very little additional change in air permeability over that caused by a load of 50 tons per inch. Discharge coefficients for various kinds of parachute cloths are also included in this report. These values may prove useful in designing new parachute textiles. (Author)

Massachusetts Inst. of Tech., Cambridge.
AIR FLOW CHARACTERISTICS OF PARACHUTE FABRICS AT SIMULATED HIGH ALTITUDES, by C. V. Seshadri, G. A. Brown and others. Rept. for 1 July 58-30 June 59 on Contract AF 33(616)5864. Mar 60, 165p. 16 refs. WADC Technical rept. 59-374.
Order from OTS $3.00 PB 161 902

The air flow characteristics of parachute canopy cloth have been measured over an unusually wide range of test conditions. High altitude simulated tests (up to 150,000 feet) have shown the cloth to have markedly low flow rates, as may be predicted from a nozzle flow analogy. A method of predicting high altitude behavior has been proposed. Permeabilities of four cloths have been shown to be significantly dependent on their state of stress at the time of air flow measurement. The magnitude of this relationship is observed to be determined by the biaxial stress-strain behavior of each fabric. The air stream deflection tendency of thick canopy material has been verified and its cause investigated. The role of pore geometry in influencing cloth permeability has been explored. (Author)

Materials Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
RESULTS OF STUDY OF NYLON AND DACRON AT HIGH TEMPERATURES, by J. W. Muse, Jr. Apr 53, 13p. Technical note WCRT 53-44.
Order from LC mi$2.40, ph$3.30 PB 149 989

This report released for sale to the public 31 Aug 60.

Results of this study show that nylon is degradated primarily by oxygen at temperatures of 212°F to 284°F. The degree of degradation is influenced by the amount of oxygen present at a specific temperature, i. e., nylon loses 21.8% of its strength after exposure for 8 hours in pure oxygen at 212°F compared to a loss of 5.45% of its strength under the same conditions in compressed air. In comparison dacron is not appreciably affected by the presence of oxygen under identical conditions. From 375°F to 425°F, dacron is degradated primarily by heat. The degree of degradation in nylon by oxygen is very severe at the conditions for which the successful application of parachute material is critical. At maximum test conditions in oxygen, nylon lost 96% in strength in contrast to dacron's 9%. This is conclusive evidence that the principal cause of degradation in nylon is oxygen, which when subjected to higher temperature, increases the rate of oxidation.

Photographic Materials

[Aerial] Reconnaissance Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
COMPARISON OF SENSITIZED MATERIALS FOR AERIAL RECONNAISSANCE, by William Mallios. Rept. on Color Photography. Sep 52, declassified 28 Aug 59. 21p. WADC Technical rept. 52-500; ATI-173 049.
Order from LC mi$2.70, ph$4.80, PB 150 098

This report released for sale to the public 30 Aug 60.

With the exception of hydrographic, geological, and forestry studies, black-and-white film is the overwhelming choice of photo interpreters as a source of aerial photographic intelligence. For certain specific purposes, however, color film and camouflage detection film are superior sources of information. Unfamiliarity of the interpreters with color and camouflage detection films exerts more influence on the film choices than the actual values and qualities of the films themselves. Lack of proper viewing equipment, with special regard to stereo, was an equally strong influencing factor on these choices. Recommendations are made that more instruction be made available through the photo interpretation schools and that more and better equipment be made available for their use, all of which should be specifically aimed at special-purpose films. (Author)

Willow Run Labs., U. of Michigan, Ann Arbor.
THE LIMITING TRACE SPACING ON FILM RELATED TO EXPOSURE AND CONTRAST RATIO, by E. Henry and M. Harrison. Memo. on Project Michigan, Contracts DA 36-039-sc-78801 and AF 33(600)38019. July 60, 19p. 5 refs. 2900-84-R.
Order from LC mi$2.40, ph$3.30 PB 149 455

Photographic film is one of the best materials known for storing maximum information in the smallest amount of medium. Data may be inserted in independent channels; it is therefore necessary to know the limiting channel spacing so that the uniqueness of each channel can be preserved. This memorandum describes a procedure to determine the limiting channel spacing. The method consists of contact-printing on a test film the image from a mirror-surfaced, optically flat glass block. In the mirror surface, lines 42 μ wide are engraved with a variable spacing from 8.5 lines/mm to 62.5 lines/mm. The image is then scanned with a specular densitometer and the light transmission recorded. The scanning aperture is 5 μ. From the recording, the contrast ratio at any resolution, i.e., the ratio of contrast at a given resolution to that at a low resolution (8.5 lines/mm) may be determined. This procedure is carried out with different amounts of exposure, all film being developed under constant conditions. A relationship is then expressed between light transmission through the image and the limiting resolution for a given contrast ratio (e.g., 0.707). Data for several commercially available films are given. (Author)

Plastics

Avco-Everett Research Lab., Mass.
HIGH TEMPERATURE BEHAVIOR OF TEFLON, by Tunis Wentink, Jr. Rept. on Contract AF 04(647)278. July 59, 15p. 18 refs. Research rept. 55; AFBMD-TN-59-15; AD-227 521.
Order from LC mi$2.40, ph$3.30 PB 146 650

The properties of tetrafluoroethylene polymer in the temperature range from 300 to 800°K are reviewed. The pyrolysis of the plastic is treated, with emphasis on behavior under ablating conditions. An effective heat of vaporization at 760°K is calculated. New data on thermal conductivity and emissivity in the infrared are presented. (Author)

Material Lab., New York Naval Shipyard, Brooklyn.
INVESTIGATION OF THE EFFECTS OF SEA WATER IMMERSION ON THE PROPERTIES OF GLASS REINFORCED POLYESTER LAMINATES, by P. M. Goldfarb. Final rept. on Lab. Project 4860-J-4. 21 Dec 59, 42p.
Order from OTS $1.25 PB 161 912

A five-year sea water immersion program on glass reinforced polyester laminates has been conducted. Five representative materials were fabricated with polyester resins and various types and constructions of glass reinforcement including glass cloth, glass mat, a combination of glass cloth and glass mat, and woven roving. The materials were immersed in the ocean at a Kure Beach, N. C., exposure station. Samples were removed from the test site yearly and sent, under water, to the Laboratory for mechanical property evaluations. It was found that a material fabricated with Garan finished Style 181 glass cloth had the best overall resistance to extended sea water immersion. A material fabricated with Volan finished Style 1000 glass cloth and a material made with Garan finished glass mat demonstrated fair resistance to sea water immersion. Two materials exhibited poor water resistance; these were a glass mat laminate with surface plies of 114 finished Style 1000 glass cloth and a Garan finished woven roving laminate. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
RADIATION-INDUCED CURRENTS IN SOLID ORGANIC INSULATORS, by J. W. Winslow and R. S. Alger. 21 May 59, 50p. 11 refs. Research and development technical rept. USNRDL-TR-325; AD-225 297.
Order from LC mi$3.30, ph$7.80 PB 150 302

This report released for sale to the public 19 Sep 60.

The general behavior of currents induced by high energy radiation in polyethylene is described. Certain considerations regarding design of circuits for operation in large radiation fluxes are discussed. The dose-rate dependence of x-ray induced photocurrents found by previous investigators at lower dose-rates appears to be extended to dose-rates as high as 15,000 r/min. The theoretical implications of this extension are discussed briefly. Calculations suggest that electrons freed from polyethylene molecules by ionizing radiation succeed in escaping permanently from their parent molecules. Attempts to measure ultraviolet-induced photocurrents in certain solidified organic solvents at near-liquid-nitrogen temperatures place an upper limit of 2×10^{-15} mho/cm on their photoconductivities at the ultraviolet intensities used. Some question is raised concerning the mechanism of color-center formation in Wurster's Blue under ultraviolet irradiation. A property of polyethylene which may be useful in detecting high-energy radiation in regions of low temperature, such as interplanetary space, is reported. (Author)

Clapp, William F., Labs., Inc., Duxbury, Mass.
MARINE BORER ACTIVITY IN TEST BOARDS OPERATED DURING 1958, by Dorothy Brown Wallour
Progress rept. no. 12 on Contract NBy-17810.
15 Mar 59, 161p. Rept. no. 11044; AD-220 191.
Order from LC mi$7.80, ph$25.80 PB 149 766

This report released for sale to the public 25 Aug 60.

The compilation of the data obtained from the study of hundreds of test boards submerged in harbors, rivers, estuaries and on lightships throughout the world over a period of years show the extent and type of marine borer destruction taking place in the test boards at various locations. All marine boring organisms are commonly referred to as marine borers. There are three general categories of these organisms: Limnoria, Teredinidae and Pholadidae, all differing in their requirements and degree of destructiveness. Attention has been called to the presence of the different groups in the descriptive section of activity evaluations in this report. Photographs of the test boards showing the degree of attack are included in this report in order to give a more accurate presentation of the evaluation of the activity by Limnoria and Teredinidae. The activities of these two organisms are graphed separately. It is difficult to estimate the amount of damage caused by marine borers at any particular area due to the fact that its activity varies greatly from year to year. However, some general trends are discernible. The activity by both the marine borers Limnoria and Teredinidae continues to show a slight upward trend along the New England seacoast. A slight upward trend is also noted in marine borer activity in the New York area. (Author)

Material Labs., Puget Sound Naval Shipyard, Bremerton, Washington.
MARINE SERVICE LAMINATING PROPERTIES OF SELECTED WOOD SPECIES: TEAK, MAPLE, ANGELIQUE, KOKRODUA, GREENHEART, EKKI, KHAYA, PHILIPPINE MAHOGANY, CENTRAL AMERICAN MAHOGANY, SOUTHERN PINE (TREATED AND UNTREATED), by R. F. England and E. Stahl.
May 60, 68p. Final development rept. E-412A.
Order from LC mi$3.90, ph$10.80 PB 149 781

For extension of marine laminating to include species other than oak and Douglas fir, series of laminates were produced under closely duplicated conditions evaluated for glueline quality. With the exception of greenheart, ekki, and in some cases, maple, the following in the series were successfully laminated at center glueline cure of 150°F for six hours: teak, angelique, khaya, kokrodua, Philippine mahogany, Central American mahogany and southern pine (untreated and tanalith treated).

Naval Civil Engineering Lab., Port Hueneme, Calif.
TOXICITY OF CHEMICALS TO MARINE BORERS. I, by Harold P. Vind and Harry Hochman. Interim rept.
29 June 60, 141p. 24 refs. Technical rept. 048.
Order from OTS $2.75 PB 161 909

Methods for evaluating the toxicity of chemical agents to marine borers were developed and toxicity data covering the testing of several hundred compounds and mixtures were processed. The purpose of this report is to organize, condense, and interpret the results of these tests together with all available data on the toxicity of chemicals to marine wood-boring organisms. (Author)

Naval Research Lab., Washington, D. C.
MARINE BORER CONTROL. PART X. EVALUATION OF CREOSOTE-RESIN SOLUTIONS AND CREOSOTE DISTILLATION FRACTIONS, by T. R. Price and T. R. Sweeney. Interim rept.
27 July 60, 11p. 7 refs. NRL rept. 5505.
Order from OTS $0.50 PB 161 695

Three resins were combined with creosote, using several curing agents, in order to determine their ability to increase the resistance of creosoted wood to marine borer attack by reducing the leaching rate. Distillation fractions of creosote were studied to determine the relationship of boiling point to effectiveness as marine wood preservatives. Nitrated and hydrogenated creosotes were also studied for their preservative effect. It was determined that several of the resin-creosote solutions were significantly better than creosote alone in providing protection to wood against Limnoria attack when pre-leached. No improvement with respect to Teredinidae attack would be detected and some evidence of decreased effectiveness was determined. The effectiveness of the creosote distillation fractions was determined to be proportional to their boiling point. Hydrogenated creosote was found to be a very poor wood preservative, and nitrated creosote, though a very good wood preservative, was not very useful because of extremely high viscosity. (Author) (See also PB 151 807)

Royal Inst. of Tech. (Sweden).
STUDIES ON THE HEARTWOOD CONSTITUENTS OF CONIFERS, by T. Kubota, Y. Hirose and others.
Final technical rept. for 1 Apr 59-31 Mar 60 on Contract DA 91-591-EUC-1113. 25 Apr 60, 59p. 36 refs.
Order from LC mi$3.60, ph$9.30 PB 149 451

Investigations were continued on the heartwood constituents of the Moroccan conifer Tetraclinis articulata especially the diterpenic substances hinokiol, hinokione, totarol and totarolone, and on the heartwood terpenes of the Alaskan conifer Chamaecyparis nootkatensis. A gas chromatographic study was carried out of the complex mixture of monoterpenes from the bark of the common juniper, Juniperus communis. An interesting new diterpene acid has been isolated from the bark of Juniperus communis.

MATHEMATICS

Aarhus U. (Denmark).
INVESTIGATIONS ON THE VALIDITY OF THE ARC-SINE LAW, by Erik Sparre Andersen. Technical summary rept. no. 2 on Contract AF 61(052)52.
29 Feb 60, 7p. 3 refs. AFOSR-TN-60-674.
Order from LC mi$1.80, ph$1.80 PB 149 584

For a sequence of r.v.'s $X_1, X_2, \ldots$ the r.v. N_n is defined as the number of positive sums among $S_1, \ldots, S_n$, where $S_k = X_1 + \ldots + X_k$. Under rather general assumptions on $X_1, X_2, \ldots$ the limit distribution of N_n/n is known to be the arc-sine law:

$$F(x) = \frac{2}{\pi} \arcsin x^{1/2} \quad 0 \leqq x \leqq 1.$$

New sufficient conditions for the validity of the arc-sine law for N_n have been obtained. Furthermore the limit distribution of N_n/n has been found in some special cases, where the arc-sine law does not hold. (Author)

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ALMOST PERIODIC FUNCTIONS OF SEMIGROUPS, by K. Deleeuw and I. Glicksberg. Technical note no. 12 on Contract AF 49(638)294. 31 May 60, 83p. 14 refs. AFOSR-TN-60-488. AD-238 540.
Order from LC mi$4.80, ph$13.80 PB 148 740

The fundamental approximation theorem for almost periodic functions on groups is extended to certain commutative topological semigroups. (Author)

Applied Mathematics and Statistics Labs., Stanford U., Calif.
APPROXIMATIONS TO OPTIMAL POLICIES IN A DYNAMIC INVENTORY MODEL, by Donald M. Roberts. Technical rept. no. 12 on Contract Nonr-225(28). 29 July 59, 54p. 17 refs. AD-219 880.
Order from LC mi$3.60, ph$9.30 PB 147 798

An investigation is presented of the 2-bin policy which is characterized by 2 critical numbers, s and S, such that whenever the stock level falls below s, an order is placed to bring the level up to S, and otherwise no ordering is done. In approximating the critical numbers by numerical means, an attempt is made to give analytical formulas for determining the asymptotic reorder quantity under the following conditions; (1) all costs are linear, and the costs during any period are composed of a holding cost and a shortage cost, both payable at the end of a period, while the ordering cost is composed of a set-up cost and a unit cost payable whenever an order is placed; (2) demand in each period is an independent observation from a known distribution function; (3) the program lasts an infinite number of periods; and (4) the stock level can be negative (the backlog case). Cases are considered corresponding to instantaneous delivery of order items as well as fixed time lags in delivery. The supposition is made that the decision maker seeks to minimize the total expected costs, discounting future costs to the present.

Applied Mathematics and Statistics [Labs.] Stanford U., Calif.
ASYMPTOTIC VARIANCE AS AN APPROXIMATION TO EXPECTED LOSS FOR MAXIMUM LIKELIHOOD ESTIMATES, by William Commins, Jr. Technical rept. no. 46 on Contract N6onr-251(40). 30 Apr 59, 46p. 7 refs.
Order from LC mi$3.30, ph$7.80 PB 146 457

Applied Mathematics and Statics Labs., Stanford U., Calif.
ONE-SIDED INEQUALITIES OF THE CHEBYSHEV TYPE, by Albert W. Marshall and Ingram Olkin. Technical rept. no. 48 on Contract N6onr-25140. 6 Aug 59, 24p. 2 refs. AD-220 545.
Order from LC mi$2.70, ph$4.80 PB 148 159

A one-sided inequality of the Chebyshev type: Let $\overline{x} = (x_1, \ldots, x_k)$ be a random vector with $\overline{E_{x_i}} = 0$. Either (1) $Ex_i^2 = \sigma^2$, $Ex_i x_j = \sigma^2 \rho$ $(i \neq j)$, $i, j = 1, \ldots, k$; or (2) $Ex_i^2 = \sigma_i^2$, $i = 1, \ldots, k$. In each case, a sharp upper bound (only involving the specified moments) for $P\{x_1 \geq 1 \text{ or } \ldots \text{ or } x_k \geq 1\}$ is obtained.

A formulation for more general one-sided bounds is also discussed. A one-sided analog of Kolmogorov's inequality: For every positive ε and every square integrable random variable X with zero expectation, $P\{X \geq \varepsilon\} \leq E(X^2)/[\varepsilon^2 + E(X^2)]$. An inequality is obtained that generalizes this in the same way that Kolmogorov's inequality generalizes Chebyshev's inequality. The inequality is proved and an example is given to show that inequality is achieved. The possibility of obtaining greater generality is also discussed. An extension to continuous parameter martingales is obtained, and a condition under which equality is achieved is given.

Applied Mathematics and Statistics Labs., Stanford U., Calif.
OPTIMAL POLICY FOR DYNAMIC INVENTORY PROCESS WITH STOCHASTIC DEMANDS SUBJECT TO SEASONAL VARIATIONS, by Samuel Karlin. Technical rept. no. 13 on Contract Nonr-225(28). 31 July 59, 44p. 10 refs. AD-220 501
Order from LC mi$3.30, ph$7.80 PB 147 797

A study is made of a dynamic stochastic inventory problem in which the demand distribution may vary over successive periods in a cyclical fashion. This may reflect a situation where the demand undergoes seasonal variations. Subject to some conditions on the cost functions, an optimal policy for this model is characterized. A computational procedure is provided for determining explicitly the critical numbers which characterize the optimal policy. The inventory model considered is the standard one involving discrete time periods. A sequence of ordering decisions is to be made at the beginning of each of a number of periods of equal duration. The demand in each period is assumed to be a random variable with known probability distribution which may vary from period to period. Various costs are incurred during successive periods. The three main costs which influence the ordering decision are: (1) the purchasing cost, (2) a holding cost associated with the stock of inventories on hand, and (3) the shortage or penalty cost. The objective is to determine ordering policy which minimizes the cumulative expected costs. The problem is treated under instantaneous delivery assumption, and in the situation where a significant time lag in delivery is present.

Applied Mathematics and Statistics Labs., Stanford U., Calif.
POLYA TYPE DISTRIBUTIONS OF CONVOLUTIONS, by Samuel Karlin and Frank Proschan. Technical rept. no. 14 on Contract Nonr-225(28). 24 Aug 59, 35p. 16 refs. AD-225 464.
Order from LC mi$3.00, ph$6.30 PB 148 162

New classes of totally positive kernels are characterized that arise from summing independent random variables and forming related first passage time distributions. A general theorem is obtained which asserts that for Pólya frequency densities of a given order, the probability that first passage into the set $[X, \infty]$ for the stochastic process of successive partial sums occurs at the n^{th} transition, is a totally positive function in the variables n, x of the same order. A different kind of characterization is given which shows that g(n, x), the n-fold convolution of a Pólya frequency density of order k extending over the whole real line, does not possess a restricted variation limiting property. Various applications of these results are noted. A number of totally positive functions are constructed by forming successive convolutions of Pólya frequency densities and then applying the general theorem. Several smoothening properties possessed by the kernel $f^{(n)}(x)$, the n-fold convolution of f, is established when it defines a linear transformation.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
DISCRETE LINEAR PROGRAMMING, by Raoul J. Freeman and John G. Hocking. Sep 55, 11p. Memo. rept. no. 924.
Order from LC mi$2.40, ph$3.30 PB 149 994

This report released for sale to the public 31 Aug 60.

The question of obtaining discrete or integer solutions to linear programming problems is attacked. Starting from the continuous solution, a procedure is developed, whereby the best integral solution "near" the continuous solution is found, and then a method is indicated as to how to obtain the optimal discrete solution from that point. A numerical example is included to illustrate the technique. (Author)

Brown U. [Div. of Applied Mathematics] Providence, R. I.
EXTENSION TO THEORY OF TIME SERIES ANALYSIS. Quarterly rept. no. 6, 1 Nov-31 Jan 60, on Contract DA 36-039-sc-78130. [1960] 2p.
Order from LC mi$1.80, ph$1.80 PB 149 115

Brown U. Div. of Applied Mathematics, Providence, R. I.
FREQUENCY FUNCTIONS OF QUADRATIC FORMS BY CONVOLUTION, by W. Freiberger, and C. L C. Kalkman. Technical rept. no. 8 on Contract DA 36-039-sc-78130. Jan 60, 9p. DA-SC-78130/8; AD-235 442.
Order from LC mi$1.80, ph$1.80 PB 149 116

A mathematical method and corresponding computer program are described for the evaluation of the frequency function of a quadratic form in random normal variables. (Author)

California U., Los Angeles.
A POSTERIORI PROBABILITIES, by Wayne E. Smith. Rept. on Management Sciences Research Proj. [Contract Nonr-223(02)] 3 Sep 58, 9p. 5 refs. Research rept. no. 54.
Order from LC mi$1.80, ph$1.80 PB 148 831

Each time a person carries out any action, he is forced to to make at least an implicit estimate of probabilities connected with plausible outcomes of his action. As he carries out experiments or makes observations, his original probability estimates change, and as they change he may vary his strategy. The explicit purpose here is to examine the nature of these changes (if they are rational) and to examine the computational implications of making the changes quantitatively.

California U., Los Angeles.
AN A POSTERIORI PROBABILITY METHOD FOR THE DETERMINATION OF THE FUNDAMENTAL CONSTANTS OF ATOMIC PHYSICS, by Wayne E. Smith. Rept. on Management Sciences Research Proj. [Contract Nonr-223(02)] 10 Sep 58, 25p. 3 refs. Research rept. no. 55.
Order from LC mi$2.70, ph$4.80 PB 148 832

A description is given of the methods of a posteriori probability (as outlined in PB 148 831) as applied to the determination of some physical constants. A hypothesis is formulated concerning the errors in measurement and a test of this hypothesis is demonstrated. After rejecting the original hypothesis a new hypothesis is formulated involving various possible distributions of the errors in measurement each with an a priori probability. The method of obtaining a posteriori probabilities is discussed, the procedure followed is outlined, and the a posteriori probabilities are tested for sensitivity to the assumed values of various parameters.

California U., Los Angeles.
APPLICATION OF A POSTERIORI PROBABILITY TO THE ANALYSIS OF THE FREQUENCY OF DEMAND AND TO THE EFFICIENT MINIMIZATION OF A FUNCTION, by Wayne E. Smith. Rept. on Management Sciences Research Proj. [Contract Nonr-223(02)] 19 Sep 58, 17p. 10 refs. Research rept. no. 56.
Order from LC mi$2.40, ph$3.30 PB 148 833

The philosophy and method of a posteriori probability is outlined. The analysis of the frequency of demand is considered and a method of efficient computational minimization of a function is described which depends on the cost of the computation involved in evaluating the function.

California U., Los Angeles.
A STABILITY CRITERION AND ITS APPLICATION TO THE COMPUTATION OF THE ZEROS OF A POLYNOMIAL, by E. L. Aparo. Technical rept. on ONR Contract. 11 Sep 58, 8p.
Order from LC mi$1.80, ph$1.80 PB 148 839

A finite-iterative procedure is described for the computation of real and complex roots of a polynomial with real coefficients. It is valid also in the case of multiple roots, giving each root repeated as many times as its order of multiplicity.

Carnegie Inst. of Tech., Pittsburgh, Pa.
NOTES ON THE USE OF F IN THE ANALYSIS OF VARIANCE OF ATTRIBUTES DATA AND ON THE TRANSFORMATION OF MEASUREMENTS DATA TO ATTRIBUTES DATA, by Edwin G. Olds and John S. Lewis. Rept. on Research on Transformations on the Analysis of Variance, Contract AF 33(616)3878. May 60, 46p. 11 refs. ARL Technical note 60-118.
Order from OTS $1.25 PB 161 943

The distributions of test statistics, corresponding to F and χ^2/df, for single-factor experiments when replications are Bernonilli trials, are derived for small-sample cases. The relative advantages of the two statistics are considered when nominal percentage points are to be used. The problem of finding the best method of transforming measurements data from a two-factor experiment to attributes data is discussed and exemplified. (Author)

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
RATIONAL EXPECTATIONS AND THE THEORY OF PRICE MOVEMENTS, by John F. Muth. ONR Research memo. no. 65 on Planning and Control of Industrial Operations, Contract Nonr-760(01). Aug 59, 44p. 40 refs. AD-225 471.
Order from LC mi$3.30, ph$7.80 PB 148 170

A simple explanation is presented of the formation of informed predictions of future events (expectations). The general assumption called the rational expectations hypothesis, is that the expectations are essentially the same as the prediction of the relevant economic theory. To show that the hypothesis is not unreasonable it is applied to the theory of short-run commodity price movements as an alternative to the cobweb theorem. The theory is shown to have a superior predictive ability and to imply the cobweb effect. The theory also explains the behavior and economic effects of commodity carryover, which is not possible with the cobweb theory in its original form. The rational expectations hypothesis is stated in the following way: The expectations of firms or households (or the subjective probability distribution of outcomes) tend to be distributed, for the same information set, about the prediction of the theory (or the objective probability distribution of outcomes). The various forms of the cobweb theorem are summarized. The hypothesis is used to explain the price movements in a market affected by current production and consumption. The model is then extended to allow for inventory speculation. The empirical implications of the alternative models are then compared.

Colorado U., Boulder.
ON THE CONVERGENCE OF THE EVEN PART OF CERTAIN CONTINUED FRACTIONS, by W. J. Thron. Rept. on Contract AF 49(638)100. [1960] 8p. 4 refs. AFOSR-TN-60-764; AD-240 163.
Order from LC mi$1.80, ph$1.80 PB 149 573

Columbia U., New York.
ABELIAN EXTENSIONS OF DIFFERENTIAL FIELDS, by E. R. Kolchin. Technical rept. no. 2 on Contract Nonr-266(57). Oct 59, 21p. 5 refs. AD-227 745.
Order from LC mi$2.70, ph$4.80 PB 149 853

The Galois theory of differential field is concerned with strongly normal extensions of a differential field F with algebraically closed field of constants C of characteristic 0. A strongly normal extension of F with Galois group birationally isomorphic to the subgroup G_K of an algebraic group G defined over C, or to an algebraic subgroup of G_K, is called a G-extension of F. The strongly normal extensions are characterized which are A-extensions for some abelian variety A. Such an extension is called an abelian extension. The characterization found is in terms of solutions of certain kinds of differential equations, and generalizes the result previously discussed for the case in which the extension is of transcendence degree 1, i, e., A is of dimension 1.

Columbia U., New York.
MARKOV RENEWAL PROCESSES: DEFINITIONS AND PRELIMINARY PROPERTIES, by Ronald Pyke. Rept. on Contract Nonr-266(59). 3 Oct 59, 31p. 12 refs. CU-10-59-NONR-266(59) MS; AD-227 271.
Order from LC mi$3.00, ph$6.30 PB 149 852

The definition of and some preliminary results are presented on Markov renewal processes and semi-Markov processes. The close relationship between these 2 types of processes is described. The concept of regularity is introduced and characterized. A classification of the states of a Markov Renewal process is described and studied. (Author)

Columbia U., New York.
A STORAGE MODEL FOR CONTINUOUS INFINITELY DIVISIBLE INPUTS OF "POISSON" TYPE, by J. Gani and N. U. Prabhu (Karanatak U.). Rept. on Contract Nonr-266(59). [1959] 26p. 13 refs. CU-4-59-Nonr-266(59)MS, AD-216 578.
Order from LC mi$2.70, ph$4.80 PB 146 413

This work considers a dam subject to steady release, and with continuous inputs having infinitely divisible distributions of the 'Poisson' type. The properties of such inputs are specified, and an integro-differential equation for the distribution function F(z, t) of the dam content Z(t) at time t is derived. Using Laplace-Stieltjes transforms, a general equation is obtained for F(z, t) in terms of the input distribution, and the probability of emptiness F(O, t) of the dam. The probability distribution for the 'wet period' T is also found, and its relation to F(O, t) established; the first passage problem for Z(t) is then examined.

Control Systems Lab., U. of Illinois, Urbana.
SAMPLING DISTRIBUTION OF THE AUTOCORRELATION AND POWER SPECTRUM FUNCTIONS, by Leroy Augenstine. Rept. on Contract DA 36-039-sc-56695. Jan 57, 34p. 10 refs. Rept. no. R-78; AD-157 257.
Order from LC mi$3.00, ph$6.30 PB 149 399

Copenhagen U. (Denmark).
ON CERTAIN CONVERGENCE PROPERTIES FOR SEQUENCES OF INDICATORS, by O. Barndorff-Nielsen. Technical scientific note no. 2 on Contract AF 61(052)42. 19 Dec 59, 14p. 2 refs. AFOSR-TN-60-235.
Order from LC mi$2.40, ph$3.30 PB 149 580

This note contains some investigations of the connection between convergence properties for sequence of indicators $I_1, I_2, \ldots, I_n, \ldots$ and certain of their subsequences. An indicator is a random variable assuming only the values 0 and 1. The main result is Theorem 1, from which it follows that the random variable

$$\frac{I_1 + I_2 + \ldots + I_n}{n}$$

converges weakly (or in distribution) if and only if

$$\frac{I_{k_1} + I_{k_2} + \ldots + I_{k_n}}{n}$$

converges weakly, where $I_{k_1}, I_{k_2}, \ldots, I_{k_n}, \ldots$ is a "not too thin" subsequence of $I_1, I_2, \ldots, I_n, \ldots$. The results are applied to the question of the asymptotic behavior of the number of positive sums of random variables. (Author)

Digital Computer Lab., U. of Illinois, Urbana.
THE USE OF CHEBYSHEV MATRIX POLYNOMIALS IN THE ITERATIVE SOLUTION OF LINEAR EQUATIONS COMPARED TO THE METHOD OF SUCCESSIVE OVERRELAXATION, by Gene Howard Golub. (Doctoral thesis). Rept. on Contract N[6]ori-07130. 16 Mar 59, 137p. 9 refs. Rept. no. 85.
Order from LC mi$6.90, ph$21.30 PB 148 792

Contents:
On averaging processes
A modification of the averaging methods
The numerical behavior of the generated sequences
A numerical example

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
BOUNDS FOR EIGENVALUES AND THE METHOD OF INTERMEDIATE PROBLEMS, by Alexander Weinstein. Rept. on Contract AF 49(638)228. July 60, 26p. 16 refs. Technical note BN-212; AFOSR-TN-60-722. AD-239 532.
Order from LC mi$2.70, ph$4.80 PB 149 100

This paper amplifies the contents of a lecture given in June 1960 at the International Symposium on Partial Differential Equations, Mathematics Research Center, University of Wisconsin. The paper gives an analysis of some recent developments in the theory of eigenvalues. (Author)

Johns Hopkins U., Baltimore, Md.
ON SOLUTIONS OF THE HELMHOLTZ EQUATION IN EXTERIOR DOMAINS, by Philip Hartman and Calvin Wilcox. Technical note no. 16 on Contract AF 18(603)41 and DA 11-022-ORD-2059. May 60, 38p. 20 refs. AFOSR-TN-60-582, AD-239 065.
Order from LC $3.00, ph$6.30 PB 148 930

This paper is concerned with the set of solutions W_H of (1) $\Delta V + V = 0$ defined on a part of Euclidean space E_p, $p \geq 2$, containing some region $|x| \geq \rho (\geq 0)$ and subject to the Herglotz condition (2) lim sup $r^{-1} \int_{\rho \leq |x| < r} |V(x)|^2 dx < \infty$ as $r \to \infty$.

Liège U. (Belgium).
RESEARCH IN HYPERBOLIC DIFFERENTIAL EQUATIONS, by Florent J. Bureau. Annual summary rept. on Contract AF 61(052)86. 15 Mar 60, 4p. AFOSR-TN-60-677.
Order from LC mi$1.80, ph$1.80 PB 149 585

Lockheed Aircraft Corp., Sunnyvale, Calif.
A GEOMETRICAL APPROACH TO THE SECOND-ORDER LINEAR DIFFERENTIAL EQUATION, by C. M. Petty. Technical rept. on Mathematics. June 60, 56p. 10 refs. LMSD-288250.
Order from LC mi$3.60, ph$9.30 PB 149 892

The strength of various assumptions on the properties of the solutions of the linear differential equation $\ddot{u} + R(t)\, u = 0$ are studied. A close relationship is established with a partial differential system, in the context of which is found a convenient setting for the theorems and proofs of the studies. Non-oscillatory equations are discussed separately. The major analytic relations are derived, and the major geometrical tools are developed. A surprisingly close relationship is established connecting the differential equation introduced with the geometry of the Minkowski plane. The major results in a possible classification theory are derived, with proofs drawing heavily on the analytic and geometrical tools previously discussed. (Author)

Michigan State U. [East Lansing]
NONPARAMETRIC TESTS FOR LOCATION AND SCALE PARAMETERS IN A MIXED MODEL OF DISCRETE AND CONTINUOUS VARIABLES. I, by Shashikala Sukhatme. Interim technical rept. no. 16 on Research in Multivariate Analysis, Contract DA 20-018-ORD-14735. 8 Mar 60, 34p. 18 refs. OOR rept. 1840.14-M; AD-235 464.
Order from LC mi$3.00, ph$6.30 PB 148 509

Let $Z_1, \ldots, Z_N$, where $Z_1 = (X_1, Y_1)$, be N independent observations from a bivariate distribution. Assume that the random variable X takes only two values, 1 and 0, with $P(X=1) = p$ and $P(X=0) = 1-p = q$. Let the conditional distribution of Y, given $X = j$ $(j = 0, 1)$, be $P(Y \leq y \mid X = j) = F_j(y)$. The hypothesis H: $F_1 = F_0$ is tested against the alternative A: $F_1 \neq F_0$.

Michigan State U. [East Lansing]
NONPARAMETRIC TESTS FOR LOCATION AND SCALE PARAMETERS ON A MIXED MODEL OF DISCRETE AND CONTINUOUS VARIABLES, II, by Shashikala Sukhatme. Interim technical rept. no. 17 on Research in Multivariate Analysis, Contract DA 20-018-ORD-14735. 16 Mar 60, 11p. 3 refs. OOR-rept. 1840.15-M; AD-235 503.
Order from LC mi$2.40, ph$3.30 PB 148 510

A rank test for dispersion and a two-sample run test are discussed in connection with the nonparametric tests for location and scale parameters in a mixed model of discrete and continuous variables. (Author)
(See also PB 148 509)

Michigan U. Research Inst., Ann Arbor.
ABSOLUTELY CONVERGENT POWER SERIES, by F. Bagemihl and G. Piranian. Technical note on Contract AF 49(638)633. June 60, 12p. 6 refs. 2913-2-T; AFOSR-TN-60-574; AD-239 274.
Order from LC mi$2.40, ph$3.30 PB 148 799

It has been known for some time that power series exist that map the unit circle C onto a Peano curve and that converge absolutely on C. The present note exhibits a new example which has the additional property that it maps the unit disk D onto a Riemann surface of finite area. The note also shows that it is possible for a power series to converge absolutely on C and to map C onto a Jordan curve that has both rectifiable and nonrectifiable arcs. A number of unsolved problems are stated. (Author)

Minnesota U., Minneapolis.
CONTRIBUTIONS TO THE THEORY OF RANK ORDER STATISTICS: COMPUTATION RULES FOR PROBABILITIES OF RANK ORDERS, by I. Richard Savage. Technical rept. no. 9 on Contract Nonr-2582(00). 1 Sep 59, 4p. 3 refs. AD-220 766.
Order from LC mi$1.80, ph$1.80 PB 148 912

Rules are given for computing the probabilities of rank orders for the 1- and 2-sample problems. For the 1-sample problem, the rule permits the computations for samples of size n from the results with samples of $n \neq 1$. For the 2-sample problem the rule permits the computations for samples of size m and n from the results with samples of $m \neq 1$ and n (m and $n \neq 1$). Most computations, done analytically, are built up from smaller to larger sample sizes and the results have limited value, e.g., in checking numerical work. For Monte Carlo sampling, there is no reason for starting with the smaller samples. (Author) (See also PB 148 911)

Minnesota U., Minneapolis.
CONTRIBUTIONS TO THE THEORY OF RANK ORDER STATISTICS; THE TWO-SAMPLE CENSORED CASE, by U. V. R. Rao (Indiana U.), I. R. Savage, and M. Sobel (Bell Telephone Labs.). Technical rept. no. 8 on Contract Nonr-2582(00). 1 Sep 59, 19p. 4 refs. AD-220 765.
Order from LC mi$2.40, ph$3.30 PB 148 911

Rank order theory is developed for the 2-sample problem in which censoring of the observations has occurred, i.e., not all of the random variables are observed. The rank orders are not all equally likely under the null hypothesis and thus the likelihood ratios of rank orders are considered. In applying the results of this paper, there is a strong analogy to sequential analysis. The censoring scheme procedure corresponds to the stopping rule and in both cases the terminal decision procedure is based on the likelihood ratio. The detailed applications are not given of the present theory to either those procedures or the new ones introduced here. (Author) (See also PB 144 399)

Minnesota U. [Minneapolis].
NOTE ON THE TENSOR PRODUCT OF BANACH ALGEBRAS, by B. R. Gelbaum. Rept. on Contract AF 49(638)526. 18 June 60, 5p. 3 refs. AFOSR-TN-60-673; AD-239 606.
Order from LC mi$1.80, ph$1.80 PB 149 076

The relation between the maximal ideal space of a tensor product of Banach algebras and the Cartesian product of the maxima ideal spaces of the algebras is investigated from the standpoint of the kernal-hull topologies. (Author) (See also PB 135 361)

Minnesota U. School of Business Administration, Minneapolis.
SOME PROPERTIES OF THE SPEARMEN ESTIMATOR IN BIOASSAY, by Byron William Brown, Jr. Technical rept. no. 6 on Contract Nonr-2582(00). 1 June 59, 107p. 31 refs.
Order from LC mi$5.70, ph$16.80 PB 146 965

This paper presents an evaluation of the Spearman estimator, a non parametric estimator of μ.

Naval Ordnance Lab., White Oak, Md.
BOUNDS FOR EIGENVALUES OF THE FREE AND FIXED MEMBRANE BY FINITE DIFFERENCE METHODS, by Bert Hubbard. 31 May 60, 54p. 76 refs. NAVORD rept. 6874.
Order from OTS $1.50 PB 161 940

This paper gives explicit upper and lower bounds for the eigenvalues of both the free and fixed membrane problems in terms of the eigenvalues of analogous finite difference problems. In each case the difference between the upper and lower bounds is of the order of the mesh width. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
APPROXIMATIONS IN VARIATIONAL PROBLEMS, by Lu Ting. Rept. on Contract AF 49(638)445. July 60, 19p. 5 refs. PIBAL rept. no. 610; AFOSR TN-60-789.
Order from LC mi$2.40, ph$3.30 PB 149 899

If there are small terms (of the order $\varepsilon << 1$) in the functional and/or in the accessory equation, the extreme of the functional taking into account the first order effect of those small terms can be obtained by the following procedure. The Euler equation or equations are approximated by omitting the small terms. The solution of the approximate Euler equation subjected to the exact accessory equations is then obtained. With this solution, the value of the functional evaluated without omitting any term differs from the true extreme by the order of ε^2. This statement is applied to the problem of optimum rocket trajectory. It is concluded that the relative simple solution of Dommasch and Barron does yield the correct optimum value taking into account the first order effect of aerodynamic forces and that of the variation of gravitational and centrifugal forces due to elevation. (Author)

Princeton U., N. J.
NONLINEAR DIFFERENTIAL EQUATIONS AND NONLINEAR OSCILLATIONS, by S. Lefschetz. Final rept. for 15 Aug 46-30 Sep 59 on Contract Nonr-1858(04). [1959] 34p. 25 refs.
Order from LC mi$3.00, ph$6.30 PB 148 601

Reviews the papers and personnel associated with the project.

RIAS, Baltimore, Md.
ON THE METHOD OF AVERAGING, by J. K. Hale. Rept. on Contract AF 49(638)382. May 60, 17p. 9 refs. Technical rept. 60-13; AFOSR-TN-60-270.
Order from LC mi$2.40, ph$3.30 PB 148 658

The method of averaging of van der Pol was devised to obtain periodic and almost periodic solutions of quasi-linear systems of differential equations. A theorem is stated for a particular case where this method has been justified mathematically and an example is given to illustrate the results. (Author)

Rice Inst., Houston, Tex.
A FLUX INTEGRAL FOR FUNCTIONS WHICH HAVE HARMONIC SUPPORT, by Guy Johnson. Rept. on Contract AF 49(638)632. 20 Apr 60, 38p. 19 refs. AFOSR-TN-60-444.
Order from LC mi$3.00, ph$6.30 PB 148 975

A flux integral for functions which have harmonic support is defined and its validity on rectifiable curves is established. A Gauss theorem yielding the mass distribution for a logarithmic potential of this class is shown to be valid for a domain whose boundary consists of a finite set of rectifiable Jordan curves. (Author)

Rutgers State U., New Brunswick, N. J.
DIFFERENTIAL FORMS OF BOUNDED p-VARIATION, by Victor L. Shapiro. Rept. on Contract AF 18(600)1595. 7 July 60, 27p. 6 refs. AFOSR-TN-60-759.
Order from LC mi$2.70, ph$4.80 PB 149 910

Stanford Electronics Labs., Stanford U., Calif.
A GENERALIZATION OF THE SAMPLING THEOREM, by D. A. Linden and N. M. Abramson. Rept. on Contract Nonr-225(44). 28 Aug 59, 11p. 6 refs. Technical rept. no. 1551-2; AD-225 884.
Order from LC mi$2.40, ph$3.30 PB 148 188

The sampling theorem for bandlimited functions allows one to reconstruct exactly a function containing no frequencies higher than W cycles per sec, given the values of the function at equispaced sampling points 1/2W sec apart. This theorem is generalized to allow reconstruction, given the values of the function and its first R derivatives at equispaced sampling points, (R+1)/2W sec apart. For large R, the R-derivative expansion approaches a Taylor's series weighted by a Gaussian density about each sample point. (Author)

Statistical Lab., Case Inst. of Tech., Cleveland, Ohio.
PERCENTILES OF THE BINOMIAL DISTRIBUTION, by F. C. Leone, G. E. Haynam and others. Rept. on Contract AF 49(638)361. June 60, 37p. 12 refs. AFOSR-[TN]-60-620; AD-239 715.
Order from LC mi$3.00, ph$6.30 PB 149 078

Tables of percentiles of the binomial distribution for sample sizes $n = 10(5)100$ and $\alpha = 0.0025, 0.005, 0.01, 0.025, 0.05, 0.1, 0.9, 0.95, 0.975, 0.99, 0.995,$ and 0.9975, are presented. A brief discussion is given of the methods of evaluating percentage points of the binomial distribution, including the use of these and other related statistical tables. Some applications of the tables are mentioned. These include sampling and life-testing problems and an example of the use of the tables in theoretical work. (Author)

Statistical Techniques Research Group, Princeton U., N. J.
A SURVEY OF SAMPLING FROM CONTAMINATED DISTRIBUTIONS, by J. W. Tukey. Technical rept. no. 33 on Contract DA 36-034-ORD-2297. Dec 59, 75p. 48 refs. OOR rept. 1715.32-M; AD-230 215.
Order from LC mi$4.50, ph$12.30 PB 148 434

Virginia Agricultural Experiment Station, Blacksburg.
A SHORT TABLE OF THE HYPERGEOMETRIC FUNCTION ${}_0F_1(c;x)$ by J. Edward Jackson. Technical rept. no. 8 on The Development of Statistical Methods for Experimental Designs in Quality Control and Surveillance Testing, Contract Nonr-2352(01). June 59, 7p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 146 405

Washington U., Seattle.
DEFORMATION THEORY OF COMPLEX MANIFOLDS, by Alfred Frölicher, Edward T. Kobayashi, and Albert Nijenhuis. Technical rept. no. 10 on Contract Nonr-477(15). 15 Oct 59, 152p. 23 refs. AD-233 802.
Order from LC mi$7.50, ph$24.30 PB 149 868

Contents:
Introduction to complex structures
Vector forms in differential geometry
The Dolbeault and GLA-cohomology groups
Deformation of complex structures
The concept of F-relatedness
Differentiable families of complex structures

Washington U., Seattle.
INVARIANCE OF VECTOR FORM OPERATIONS UNDER MAPPINGS, by Alfred Frolicher and Albert Nijenhuis. Technical rept. no. 9 on Contract Nonr-477(15). 15 Oct 59, 40p. 9 refs.
Order from LC mi$3.00, ph$6.30 PB 149 498

Yale U., New Haven, Conn.
THE INVERSE FUNCTION THEOREM IN BANACH ALGEBRAS, by Einar Hille. Rept. no. 1 on Contract AF 49(638)224. Apr 59, 11p. 3 refs. AFOSR TN-59-330; AD-213 651.
Order from LC mi$2.40, ph$3.30 PB 146 450

This report contains a proof of the inverse function theorem formulated for Frechet analytic functions with domain and range in a Banach algebra. A complex parameter α is introduced in the function and the inverse function is obtained as a power series in α. The procedure makes it possible to use Cauchy's method of Calcul des limites for the convergence proof. (Author)

MATHEMATICS

Computing Devices

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
METHODS FOR OBTAINING COMPLETE DIGITAL CHAINS, by Bernard Lippel and Irving J. Epstein. 30 June 57, 18p. 8 refs. Technical memo. no. M-1850 AD-143 540.
Order from LC mi$2.40, ph$3.30 PB 149 383

Two methods are described and proved for obtaining complete digital chains (chain coded sequences which contain all the possible permutations of p kinds of symbols taken n at a time). A generalized permutation method for complete chains is also given. Possible engineering applications for chain codes are considered.

Computation Lab., Harvard U., Cambridge, Mass.
DESIGN AND OPERATION OF DIGITAL CALCULATING MACHINERY, by Howard Aiken. Progress rept. no. 38, 10 Feb-10 May 55, on Contract AF 33(038)9461. [1955] 157p. 2 refs. AD-62 231.
Order from LC mi$7.50, ph$24.30 PB 150 300

This report released for sale to the public 19 Sep 60.

This report contains the results of computations completed on the Mark I and Mark IV Calculators. The coordinate determination of ground points on aerial photographs is discussed. A mathematical description of a non-linear eigenvalue problem is presented. The solution of nineteen linear second order differential equations with two point boundary conditions is reported.

Dunlap and Associates, Inc., Stamford, Conn.
HUMAN DECISION MAKING AS RELATED TO AIR SURVEILLANCE SYSTEMS, by Andrew P. Chenzoff, Richard L. Crittenden and others. Technical rept. no. 1 on Contract AF 19(604)6164. 10 June 60, 128p. 471 refs. DA rept. no. 300-1; AFCCDD-TR-60-25.
Order from LC mi$6.30, ph$19.80 PB 149 215

This report presents a review of the literature on decision making. The objectives of this survey were: (1) to describe some of the decision making information now available in the areas of mathematics, experimental psychology, sociology and systems research; (2) to identify areas for further experimentation on human decision making. For many years to come human decision making will remain of great practical importance for many kinds of decisions even in those situations where machines are being used to the fullest extent. These experiments will therefore consider as far as possible those aspects of decision making that humans must undertake in air surveillance. (Author)

Electronics Research Lab., U. of California, Berkeley.
RECENT ADVANCES IN THE FIELD OF SAMPLED DATA AND DIGITAL CONTROL SYSTEM, by E. I. Jury. Rept. on Contract AF 18(600)1521. 20 Oct 59, 39p. 49 refs. Series no. 60, issue no. 256; AFOSR-TN-59-1017; AD-233 272.
Order from LC mi$3.00, ph$6.30 PB 146 738

Theoretical aspects are described of the progress made in the field of Sampled-Data and Digital Control Systems during the last few years. The material is classified into the following major topics: (1) linear theory, (2) statistical theory, (3) nonlinear theory, (4) time-varying theory, and (5) digital control systems. These topics are briefly described and methods of analysis and design with their major purposes and achievements are enumerated. Each category is documented with a brief list of references which might serve as a quick aid to new investigators in this field. A brief survey of digital control systems is discussed, and it is indicated how the above mentioned topics can be extended to these systems. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
MATHEMATICAL NEUROPHYSIOLOGY, by J. D. McKnight, Jr. Technical memo. Oct 59, 8p. LMSD-288038; AD-227 196.
Order from LC mi$1.80, ph$1.80 PB 148 941

The purpose was to abstract the essential mathematical elements of the classical studies made since the mid-thirties by various researchers and to extend and elaborate these elements where possible and expedient.

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
COMMON PROGRAMMING LANGUAGE TASK. PART II. AUTOMATIC CODE TRANSLATION SYSTEM (ACT), by A. W. Holt, W. J. Turanski, and D. L. Meginnity. Final rept. for 1 May 58-30 June 59 on Project ADAR, Task D, Contract DA 36-039-sc-75047. 31 July 59, 143p. AD59URI, v. 4A.
Order from LC mi$7.20, ph$22.80 PB 149 394

The study is divided into four portions, the first three of which are directly concerned with the ACT system, while the fourth (Appendix) is an example of a specialized code- Symbolic Logistico-Administrative Code (SLAC). The sections are concerned, respectively, with a general description of the Automatic Code Translation System (general purpose allocation interpreter and "core library", etc), a description of the allocation interpreter, and a discussion of Canonical Form. The SLAC System, which comprises the Appendix, has a direct relation with the section on Canonical Form. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INFORMATION RETRIEVAL AND THE DESIGN OF MORE INTELLIGENT MACHINES, by Harry J. Gray, Jr., Oliver Aberth and others. Final rept. for 1 May 58-31 June 59, on Project ADAR, Task E, Contract DA 36-039-sc-75047. 31 July 59, 216p. 15 refs. AD59UR1, v. 5; AD-235 999.
Order from LC mi$9.60, ph$33.30 PB 149 395

In order to reduce the requirements on the personnel who use data processing systems, the systems should be designed to have more intelligence. From study of human processes, a multiple list structure for information is proposed and studied. When applied to an information retrieval problem, it is found to be up to 30,000 times faster than conventional techniques. Results of investigations into the design of an optimized system are given. It is shown that the multiple list structure can perform with greater efficiency all that the Newell-Simon IPL can. Techniques are explored for the retrieval of information having descriptors which are not the same as those under which the item was filed. Results of a study of the nervous systems are given leading to specification of a parallel-access information bank which may be more efficient than the multiple list structure. Finally, some results of psychological experiments on human beings are successfully predicted from the theory of the multiple list structure. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
HUMAN FACTORS AFFECTING CONSOLE DESIGN IN THE FIELDATA SYSTEM, by Charles F. Hoban, R. Omer Lucier, and R. Flood. Final rept. for 1 May 58-30 June 59 on Project ADAR, Task B, Contract DA 36-039-sc-75047. 31 July 59, 41p. 1 ref. AD59UR1, v. 2; AD-235 998.
Order from LC mi$3.30, ph$7.80 PB 149 392

The role of human factors in system development in general, with particular reference to their treatment in the Army FIELDATA system, is studied. The consoles of the computer family being designed for the Signal Corps are then analyzed in detail as man/machine interface. The limited capacity of the Signal Corps for human factors studies, together with their methods of compensating for this lack, are noted and discussed. A critical examination is given of the parallel, rather than sequential development plan that has been adopted in the FIELDATA system. On the basis of observations made during visits to the producers of the FIELDATA equipment, console design in this family is discussed. Some of the problems analyzed include invariances in logic and console topography of different computers, and the complexities of a multifunctional console. Among the specific recommendations for improved console design are arabic numeral keyboards, redundant state-indicators and mechanical guards. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
WHAT IS A CODE? by G. W. Patterson, W. I. Landauer, and E. J. Parker. Final rept. for 1 May 58-30 June 59 on Project ADAR, Task F, Contract DA 36-039-sc-75047. 31 July 59, 43p. 12 refs. AD59UR1, v. 6. AD-236 000.
Order from LC mi$3.30, ph$7.80 PB 149 396

This study involves the definition of the word "code", and the word's relation to current meanings. It also defines syntactical subbases, syntactical bases, and it explains the formalized mathematical model of rules for forming expressions from these characters, known as a concatenation algebra. A code is a nonsingular transformation from a syntactical base into another syntactical base, and one that is effectively calculable. The process of coding is that of finding the expression in the code language, and decoding is the inverse action - both of which must be capable of being programmed on a computer. (Author)

National Bureau of Standards, Washington, D. C.
TRANSISTORIZED BUILDING BLOCKS FOR DATA INSTRUMENTATION, by J. A. Cunningham and R. L. Hill. Sep 60, 74p. 2 refs. Technical note 68.
Order from OTS $2.00 PB 161 569

The National Bureau of Standards has developed a number of modular transistorized digital circuits that have been used in automatizing many data recording and preliminary processing tasks encountered in its scientific operations. These versatile building blocks can be connected together systematically to form digital circuits that accept raw data from experimental equipment and transpose these data into a form suitable for input to a high-speed electronic computer. These blocks can be used where: (1) data are produced in large volumes; (2) data taking is extremely fast, extremely slow, or extremely precise; (3) a need exists to minimize human error, tedium and eyestrain; or (4) computation is extensive. This report describes 5 major packages and 8 special-purpose packages.

Naval Weapons Lab., Dahlgren, Va.
SUBROUTINES FOR THE NORC CRT PRINTER, by A. V. Hershey. 9 Mar 60, 45p. 8 refs. NWL rept. no. 1686; AD-234 557.
Order from LC mi$3.30, ph$7.80 PB 147 814

The computing programs in a curve plotting routine, a stereographic routine, and a character plotting routine are described. Some experimental tests with these routines are believed to be consistent with the following postulates: (1) between the datum points for a curve there is an optimum spacing which will give a distortion-free plotting of the curve for any compression of the scaling and (2) the visual interpretation of abstract stereograms is consistent with a mental impression that a central point in every image is located at the same absolute distance. (Author)

Princeton U., N. J.
THE DEVELOPMENT OF THE PRINCETON UNIVERSITY THREE-DIMENSIONAL ANALOG COMPUTING FACILITY, AND THE DEVELOPMENT OF THE PRINCETON UNIVERSITY LIFTING LINE CALCULATOR, by Whiting R. Willauer. Rept. on Contract Nonr-1858(14). June 58, 71p. 6 refs. Aeronautical Engineering rept. no. 424.
Order from LC mi$4.50, ph$12.30 PB 147 611

This report describes the development of the Princeton University Three-Dimensional Analog Computing Facility, and the modification of the Princeton University Two-Dimensional Analog Tank so that it could yield solutions to Prandtl's lifting line equation. The theory necessary for the operation of the two facilities is given. The methods of construction of the tanks, models, and electrical circuits are presented. The operation of the tanks and the difficulties en-

countered are discussed. Finally, recommendations for the expansion of the facilities and the better utilization of the existing equipment are presented. (Author)

Zemanek, Heinz, Vienna (Austria).
PROGRAMS FOR LOGICAL DATA PROCESSING, by V. Kudielka, H. Zemanek and others. Final rept. for 1 Feb 59-31 Jan 60 on Contract DA 91-591-EUC-1062. 29 Feb 60, 198p. 35 refs. AD-235 961.
Order from LC mi$8.70, ph$30.30 PB 149 452

Contents:
Conventional logical algebra
The function in the logical algebra
Rules for logical computing
Switching networks and logical algebra
Minimization
Sequential logical algebra
Time sequences
Sequential functions
Sequential networks
Application of information theory
Operations on logical functions
The representation of logical variables and functions
Sequential formula translation
Communication with physical objects
Automatic minimization
Different procedures
The minimization procedure by McCluskey
An automatic minimization procedure
Commentaries on the minimization program
Three examples

MECHANICS

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE HERTZ PROBLEM FOR A RIGID SPHERICAL INDENTER AND A VISCOELASTIC HALF SPACE, by S. C. Hunter. Technical rept. no. 1 on Contract DA 19-020-ORD-4750. Mar 60, 34p. 8 refs. Rept. no. DA-4750/1; OOR rept. no. 1892.2-E; AD-236 958.
Order from LC mi$3.00, ph$6.30 PB 148 440

The penetration of a viscoelastic half space by a rigid spherical indenter is investigated in a quasi static approximation. Solutions to the problem are obtained for monotonic contact radius $r_1(t)$ and for the case where $r_1(t)$ possesses a single maximum. The analysis is used to estimate the duration of contact and coefficient of restitution for the Hertzian impact of a spherical indenter on a Maxwell solid. (Author)

Florida U. Engineering and Industrial Experiment Station, Gainesville, Fla.
EFFECT OF MEMBRANE FORCES ON LATERAL VIBRATIONS OF RECTANGULAR PLATES, by Marc Trubert and William A. Nash. Technical note no. 2 on Contract AF 49(638)328. May 60, 60p. 23 refs. AFOSR-TN-60-437.
Order from LC mi$3.60, ph$9.30 PB 148 786

A solution to the problem of finding the natural modes of vibration of a rectangular plate loaded by membrane forces, i.e. tension (or compression), in the middle plane, is sought by the perturbation technique. The eigenvalues and eigenfunctions for the plate subjected to tension are deduced from the known eigenvalues and eigenfunctions for the plate with no tension, for the usual boundary conditions, by the use of series involving powers of the tension. General expressions for the series are formulated using the eigenfunctions of the plate with no tension as normal functions. The exact solution of the problem is given for the case of simple supported edges. A second application is made to a clamped square plate.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON SOME NEW CONTINUATION FORMULAS AND UNIQUENESS THEOREMS IN THE THEORY OR ELASTICITY, by J. H. Bramble and L. E. Payne. Rept. on Contract AF 49(638)228. July 60, 32p. 8 refs. Technical note BN-213; AFOSR-TN-60-723.
Order from LC mi$3.00, ph$6.30 PB 149 101

New formulas for the continuation of the solution to the equations of elasticity across a spherical boundary are obtained. In addition certain new boundary value problems in elasticity are considered. (Author)

Institute of Mathematical Sciences, New York U., N. Y.
THE BUCKLING OF A THICK CIRCULAR PLATE USING A NON-LINEAR THEORY, by Chester B. Sensenig. Rept. on Contract AF 49(638)161. Dec 59, 20p. 3 refs. IMM-NYU 262; AFOSR-TN-60-41; AD-233 366.
Order from LC mi$2.40, ph$3.30 PB 146 748

The stability of equilibrium for an isotropic circular cylinder when compressed along its curved lateral surface is studied. The compression on the curved part of the boundary is assumed to be such that the generators of the cylinder remain vertical straight lines, and such that no shear stress is developed. The problem is treated by making use of the non-linear 3-dimensional theory of elasticity. The formulation of the theory uses Lagrange coordinates and matrix notation. No restrictive assumptions are made concerning the thickness of the plate, and the displacements and strains are not assumed to be small. When the cylinder is compressed, the uniform plane strain satisfies all the conditions of the exact non-linear theory. A small perturbation is made, and critical pressures are found together with the corresponding modes of buckling. Only buckled modes with symmetry about the axis of the cylinder are considered.

Naval Research Lab., Washington, D. C.
FRACTURE TESTING OF HIGH-STRENGTH SHEET MATERIALS UNDER CONDITIONS APPROPRIATE FOR STRESS ANALYSIS, by G. R. Irwin. 27 July 60, 48p. 5 refs. NRL rept. 5486.
Order from OTS $1.25 PB 161 474

This report describes and justifies a method for evaluating fracture toughness of thin sheet metals, The

criteria of toughness is taken as a parameter K which characterizes the intensity of the stress field surrounding the crack tip. At fixed load, this intensity grows with crack length; when it can no longer be counteracted by the fracture toughness, crack growth becomes unstable. The field intensity parameter at this point represents a material property of fracture toughness K_C. To obtain a measure of this property, the procedure provides for tensile testing of a sheet specimen containing sharp notches or initial cracks oriented normal to the applied tensile stress. Observations of load and crack length at onset of fast fracture permits evaluation of the fracture toughness parameter K_C. In order to test specimens of convenient width, the measured crack length must be corrected for the influence of the plastic zone surrounding the crack tip. The theoretical basis for this is given in an appendix. A basis for estimating slow crack growth prior to instability without direct measurement is also appended to the text. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
CREEP BENDING OF ANNULAR PLATES, by Sharad A. Patel and B. Venkatramam. Rept. on Contract AF 49(638)302. May 60, 25p. 8 refs. PIBAL rept. no. 559; AFOSR-TN-60-528.
Order from LC mi$2.70, ph$4.80 PB 148 315

The present report is concerned with the creep bending of annular plates subjected to pure bending moments. Annular plates on simple and fixed supports are considered, and the analyses are carried out on the bases of the elastic analogue and a creep flow law formulated in similar terms to those of the plastic flow laws. Solutions for moments and deflections are presented. (Author)

Aerodynamics and Pneumatics

Aeroelastic and Structures Research [Lab.] Mass. Inst. of Tech., Cambridge.
GUST LOADS IN RIGID AND ELASTIC AIRPLANES, by R. L. Bisplinghoff, G. Isakson, and T. F. O'Brien. Rept. on Contract NOas-8790. 15 Aug 49, 115p. 21 refs. ATI-130 859.
Order from LC mi$6.00, ep$19.80 PB 150 081

This report released for sale to the public 31 Aug 60

Contents:
The rigid airplane in incompressible flow
Gust loads at high subsonic speeds.
Gust loads at supersonic speeds.
Investigation of some coupling effects in the response of an elastic airplane to gusts.
The effect of vibrational response on the distribution of load
The effect of airplane size on the transient virbational response.

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
YIELD CONDITIONS OF PLATES AND SHELLS BY MISES-HENCKY CRITERION, by T. H. H. Pian. Rept. on Contract AF 49(638)160. June 60, 19p. 7 refs. ASRL TR 76-3; AFOSR-TN-60-608.
Order from LC mi$2.40, ph$3.30 PB 149 157

Yield conditions for plates and shells under combined bending moments and stress resultants have been derived by using Mises-Hencky criterion. The relation is expressed in parametric form with three parameters. For several limiting cases, simple yielding conditions are obtained. (Author)

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
INTERFERENCE BETWEEN A JET ISSUING LATERALLY FROM A BODY AND THE ENVELOPING SUPERSONIC STREAM, by Carlo Ferrari. Rept. on Contract NOrd-7386. Apr 59, 126p. 13 refs. Bumblebee rept. no. 286; AD-226 477.
Order from LC mi$6.30, ph$21.30 PB 150 157

This report released for sale to the public 13 Sep 60

An analysis is made of the interference forces exerted upon a cylindrical body in hypersonic flow from which a jet is issuing laterally out of a circular orifice. The characteristics of the jet are first examined in order to define its centerline path and its cross-sectional shape. Once the shape of the jet is known in approximation, an approach based on Lighthill's treatment of the hypersonic blunt-body problem is employed to find the shock stand-off distance ahead of the jet spout and to approximate the flow field between the shock and the surface of the jet. It is assumed that viscosity does not alter the total interference forces acting on the body, although it is known from physical observation that separation does occur ahead of the shock, with the result that the induced pressures are reduced in magnitude and spread over a larger region of the adjacent cylinder than is premised in the idealized mathematical model employed here. A comparison is made between the calculated results and what has been measured in wind-tunnel experiments, with good confirmation of the trends and magnitudes, despite the fact that the empirical data on jet interference were obtained at lower Mach numbers (2.84 and 3.90) than those for which this present theory should be most applicable. (Author)

Arnold Engineering Development Center [Tullahoma, Tenn.]
COMPARISON OF LINEARIZED TRANSONIC FLOW THEORY WITH EXPERIMENTAL PRESSURE DISTRIBUTIONS ABOUT A PARABOLIC-ARC BODY OF REVOLUTION, by M. Pindzola. Rept. on ARO, Inc., Contract AF 40(600)800. Aug 59, 27p. 4 refs, AEDC TN-59-89; AD-220 255.
Order from LC mi$2.70, ph$4.80 PB 147 879

The pressure distributions obtained by linearized theory for transonic flow, which is based on a linear variation of the axial perturbation velocity, are compared to those obtained experimentally on a parabolic-arc body of revolution. Distributions obtained by

linearized subsonic and supersonic flow theory are also included for comparison. The subsonic and supersonic theories are shown to agree more favorably with the experimental data than with the transonic theory, except in the forward portion of the body in the Mach number range very near 1.0. (Author)

Arnold Engineering Development Center [Tullahoma, Tenn.]
DETERMINATION OF DAMPING DERIVATIVES FROM FREE-OSCILLATION TESTS OF NON-LINEAR SYSTEMS USING ENERGY RELATIONS, by C. J. Welsh, L. K. Ward, and G. R. Ahsmuhs. Rept. on ARO, Inc., Contract AF 40(600)800. June 60, 26p. 5 refs. AEDC-TN-60-104.
Order from LC mi$2.70, ph$4.80 PB 148 961

An energy analysis of the damping of a linear oscillatory system has been made and extended to non-linear wind-tunnel configurations tested over a large amplitude range. It is shown that the measured amplitude decay of the free-oscillation motion of such configurations can be an invalid measurement of the stability of the system and can induce appreciable errors in the computed damping derivatives. An approximate procedure for handling amplitude traces of non-linear configurations tested in wind tunnels and by which equivalent viscous damping derivatives can be obtained is given. Experimental damping data measured at $M = 8$ over a Reynolds number range of 0.5×10^6 to 1×10^6 based on body diameter for a flared afterbody re-entry shape indicate that the approximate procedure is quite adequate. (Author)

Arnold Engineering Development Center, Tullahoma, Tenn.
FORCE AND PRESSURE TESTS OF AN AGARD CALIBRATION MODEL B AT A MACH NUMBER OF 8, by L. D. Kayser and C. R. Fitch. Rept. on ARO, Inc., Contract AF 40(600)-800 S/A 11(60-110). July 60, 36p. 10 refs. AEDC TN-60-34.
Order from LC mi$3.00, ph$6.30 PB 149 197

Body-wing and body-only configurations of the AGARD Calibration Model B were tested at a nominal Mach number of 8 and Reynolds numbers from 0.8 to 11.0×10^6 based on model length. Forces and moments for both configurations were obtained from internal, strain-gage balance measurements. Also, force and moment coefficients for the body-only configuration were obtained by numerical integration of pressure distributions. The lift-curve slope and aerodynamic center obtained at Mach 8 compared favorably with data obtained from other tunnels at various Mach numbers. The only significant Reynolds number effect was the higher drag coefficient at the lower Reynolds numbers. (Author)

Avco-[Everett] Research Lab., Mass.
THE DIFFERENCES BETWEEN SATELLITE AND BALLISTIC MISSILE RE-ENTRY PROBLEMS, by F. R. Riddell and J. D. Teare. Sep 58, 31p. 12 refs. Research rept. 31.
Order from LC mi$3.00, ph$6.30 PB 147 197

The purpose of this paper is to point out the significant differences in the critical heating and deceleration problems which are faced in re-entry of the atmosphere from different types of trajectories. To do this we discuss two specific cases which are of current interest, the re-entry of long-range ballistic missiles and the re-entry of satellite vehicles.

Ball Brothers Research Corp., Boulder, Colo.
THE DESIGN AND PERFORMANCE OF THE BENT OGIVE POINTING CONTROL, by O. E. Bartoe, R. E. Hathaway and others. Final technical rept. on Contract AF 19(604)2656. Apr 60, 124p. AFCRC-TR-60-259.
Order from LC mi$6.30, ph$19.80 PB 148 476

An instrument called the Bent Ogive Pointing Control has been designed to facilitate measurements of the solar spectrum on rocket probe experiments. Solar pointing controls have been flown in upper atmospheric experiments since 1951 and in general have been used to orient spectrographic instruments at or relative to the sun. The Bent Ogive Pointing Control as described in this report is unique in its configuration in that the Ogive or nose cone is hinged and bent normal to the major rocket axis to achieve the desired results.

Brown U. Div. of Engineering, Providence, R. I.
HEAT TRANSFER FROM SURFACES OF NON-UNIFORM TEMPERATURE DISTRIBUTION. PART II. TURBULENT TRANSFER FROM ISOTHERMAL SPANWISE STRIPS ON A FLAT PLATE, by H. H. Sogin and R. J. Goldstein. Rept. on Contract AF 49(638)46. Feb 60, 47p. 22 refs. AFOSR-TN-60-647.
Order from LC mi$3.30, ph$7.80 PB 149 454

Experiments were performed on the mass transfer by forced convection from naphthalene strips on a flat plate to an air stream at ordinary temperature and pressure. Turbulence was induced in the boundary layer by means of a wire trip. In all cases there was a hydrodynamic starting length upstream of the strips. The ratio of this inert length to the total length was varied from about 0.80 to 0.96. The flow was practically incompressible with Reynolds number, based on the total length, varying from 175,000 to 486,000. The Schmidt number was 2.5. The experimental results fall in proximity to the Seban step function factor when they are reduced after the mass-momentum analysis of Deissler and Loeffler for a surface of uniform vapor pressure. When Kármán's formulation of the mass-momentum analogy is assumed, the data fall between the values predicted by the Seban and by the Rubesin expression for the step function factor. The results are well correlated by the Colburn analogy in conjunction with the Rubesin step function factor. (Author) (See also PB 139 919)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
BEHAVIOR OF SMALL REGIONS OF DIFFERENT GASES CARRIED IN ACCELERATED GAS FLOWS, by George Rudlinger and Lowell M. Somers. Rept. on Project Squid, Contract Nonr-1858(25). Mar 59, 39p. 17 refs. Technical rept. CAL-76-P.
Order from LC mi$3.00, ph$6.30 PB 146 544

Small regions in a flow where the density is different from that of the surrounding gas do not exactly follow accelerated motions of the latter, but move faster or slower depending on whether their density is smaller or larger than that of the main flow. This behavior cannot be quantitatively explained by treating a gas "bubble" as a hypothetical solid particle of the same density because a gas bubble cannot move relative to the surrounding gas without being transformed into a vortex which absorbs part of the energy of the relative motion. To illustrate the acceleration effect, the flow velocity behind known pressure waves in a shock tube is compared with the observed velocity of a bubble produced by a spark discharge. A theory is developed which permits computing the response of such bubbles to accelerations.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
CHEMICAL NONEQUILIBRIUM EFFECTS ON HYDROGEN ROCKET IMPULSE AT LOW PRESSURES, by J. Gordon Hall, A. Q. Eschenroeder, and J. J. Klein. Rept. on Contract AF 18(603)141. Nov 59, 12p. 7 refs. Rept. no. AD-1118-A-8; AFOSR-TN-59-1192; AD-229 134.
Order from LC mi$2.40, ph$3.30 PB 146 541

Calculations of nonequilibrium hydrogen flows were investigated for a lower range of pressures as well as a wider range of temperatures and nozzle geometry than previously considered. The calculations were made by using an approximate method of analysis for such flows. A comparison with exact numerical solutions show the criterion to give an accurate prediction of the frozen dissociation level. The approximate method is particularly convenient for determining the limiting specific impulse, I_∞, attained by expansion to infinite area and zero pressure.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
SPECTROSCOPIC TECHNIQUE FOR TEMPERATURE-DENSITY MEASUREMENTS IN OXYGEN-BEARING FLOWS, by W. H. Wurster and C. E. Treanor. Rept. on Contract AF 18(603)141. Dec 59, 47p. 13 refs. Rept. no. AD-1118-A-10; AFOSR-TN-59-1089.
Order from LC mi$3.30, ph$7.80 PB 148 773

The absorption spectrum of shock-heated molecular oxygen has been measured photoelectrically in the wavelength range 2280 to 2870 Å. Four wavelength bands were used, each about 20 Å wide. The oxygen temperatures ranged from 1500 to 4000°K, and the density from 0.01 to 2.0 atmospheres. The photoelectric results for the 20 Å bands were correlated with previous high-dispersion photographic measurements of transition probabilities and line widths for O_2. This correlation is shown in graphical form, and the use of this absorption technique to determine a temperature-density parameter for oxygen bearing flows is discussed. (Author)

Flight Dynamics Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
DESIGN PROCEDURES FOR COMPUTING AERODYNAMIC HEATING AT HYPERSONIC SPEEDS, by Wilbur L. Hankey, Jr. Richard D. Neumann, and Evard H. Finn. Rept. on Hypersonic Gas Dynamic Heating. June 60, 171p. 142 refs. WADC Technical rept. 59-610.
Order from OTS $3.00 PB 161 937

The basic concept of lifting and nonlifting re-entry vehicles is discussed and approximate trajectories presented. Analyses of flow properties and the mechanism of molecular excitation and dissociation are based on the available energy of the flow. The principle of radiation cooling of lifting re-entry vehicles is contrasted with the heat sink and ablation techniques for nonlifting re-entry vehicles. Regions of maximum heating are shown for both modes of re-entry with the equations for laminar and turbulent flow. The swept-wing lifting body at angle of attack is analyzed showing the heating equations for both leading edges and wing surfaces and including the influence of internal radiation, wall construction, and transient heating effects. Finally, graphs and charts are presented for the rapid calculation of heating rates for lifting and nonlifting re-entry bodies. (Author)

General Electric Co., Schenectady, N. Y.
INCREASE IN LIFT PRODUCED BY INTERACTION BETWEEN A CYLINDRICAL BODY AND WINGS OR TAIL FINS: CORRELATION FOR DESIGN PURPOSES BASED ON THEORY AND LIMITED TEST RESULTS, by John R. Weske. Rept. on Project Hermes [Contract DA 30-115-ORD-23] Aug 47, declassified 17 Nov 58, 28p. 7 refs. Rept. no. 55144.
Order from LC mi$2.70, ph$4.80 PB 149 464

The available wind-tunnel data at supersonic speeds relating to interference effect between wings or fins and slender bodies upon the resultant lift are correlated by means of existing theory. Distinction is made between body-wing and wing-body interaction (effect of body on the wing lift and vice versa, respectively). It is found that for wings or fins not too close to the tip nor to the base the effect of body upon the wing contributes the major portion of the increase of lift due to interference, and that it can be determined with satisfactory approximation by Beskin's method of calculation. Wing-body interaction, -i. e. effect of wing upon the body - is small compared with body-wing interaction, and may, therefore, as a first approximation be disregarded when using the Beskin method of computing body-wing interaction, particularly at angles of attack less than 6^o, since the latter appears to give results slightly high for these small angles.

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTAL STUDY OF HELIUM DIFFUSION IN THE WAKE OF A CIRCULAR CYLINDER AT M=5.8, by William Mohlenhoff. Rept. on Hypersonic Research Project, Contract DA 04-495-ORD-1960. 20 May 60, 115p. 23 refs. Memo. no. 54.
Order from LC mi$6.00, ph$18.30 PB 149 362

An experimental study of the diffusion of helium in the wake of a circular cylinder was conducted in the GALCIT hypersonic wind tunnel at a Mach number of 5.8. The cylinder was constructed of material having random porosity and was mounted with its axis perpendicular to the stream. The light gas was injected in small amounts

and the thermal conductivity method was utilized to detect the concentration of helium in the air at points downstream. Problems in the utilization of the thermal conductivity method for low sample densities were overcome by suitable calibration. Flow in the wake of the cylinder was found to display characteristically similar behavior at a few diameters downstream, with respect to decay and spread of the concentration. Reynolds number similarity was established in the laminar case, but turbulent Reynolds number similarity may require reference to momentum thickness, which was not possible with the present data. Profile data was somewhat marred by a tunnel pressure perturbation, but many of the important conclusions were not affected. The profiles appear to follow the theoretical Gaussian distribution in the similar region. The thermal conductivity method is quite promising as a means of tracing the diffusion of one binary gas constituent in another, as applied to hypersonic wind tunnel experiment. It will also serve in the analysis of transition and turbulence, and of the lateral spreading of the turbulent fluid into the rest of the wake region behind the bow shock. (Author)

Illinois U. Engineering Experiment Station, Urbana.
RESEARCH ON TRANSONIC AND SUPERSONIC FLOW OF A REAL FLUID AT ABRUPT INCREASES IN CROSS SECTION (WITH SPECIAL CONSIDERATION OF BASE DRAG PROBLEMS), by W.H. Korst, W. L. Chow, and G. W. Zumwalt. Final rept. on Technical rept. 392-5; AFOSR-TR-60-74.
Order from LC mi$7.50, ph$24.30 PB 149 174

A general theory for pressures and temperatures in separated transonic and supersonic flows is developed using a physically perceptive model composed of simplified flow components. The principle of interaction between dissipative and free stream flow regions, allows one to distinguish between inviscid flow configurations and superimposed jet mixing regions. Treatment of the latter is based on concepts previously developed and on tabulated results (including theoretical Stanton Numbers and Drag Coefficients) for fully developed isoenergetic and non-isoenergetic constant pressure turbulent (Pr_t=1) compressible two-dimensional mixing regions. A great variety of problems in internal and external flow is analyzed theoretically, ranging from the classical base pressure problem to the performance of supersonic ejectors and the detailed study of the jet-slipstream interaction (afterbody-) problem in jet engine and rocket propulsion. (Author)

Institute of Engineering Research, U. of California, Berkeley.
FLOW STUDIES IN AN ARC HEATED LOW DENSITY SUPERSONIC WIND TUNNEL, by C. L. Brundin, L. Talbot, and F. S. Sherman. Rept. on Contract AF 49(638)502. 15 Apr 60, 42p. 10 refs. HE-150-181; Series no. 132, issue no. 2; AFOSR-TN-60-592.
Order from LC mi$3.30, ph$7.80 PB 148 009

A series of experiments were carried out to evaluate several methods for determining the properties of the flow produced in a supersonic low density arc-heated wind tunnel, using argon as the test gas. These experiments included stagnation point Langmuir probe and heat transfer measurements, impact pressure surveys, and some qualitative spectroscopic studies. A typical set of operating conditions indicated by the measurements were $M \cong 6$, $P_{static} \cong 1$ mm Hg in the free jet, centerline stagnation temperature $T_t \cong 5000^{\circ}$ K, and approximately 0.2% ionization with an electron temperature of about $2 \times 10^{4\circ}$K. (Author)

James Forrestal Research Center, Princeton, N. J.
AN "UNUSUAL" AERODYNAMIC STAGNATION TEMPERATURE EFFECT, by Irvin Glassman and James E. A. John. Rept. on Project Squid, Contract Nonr-1858(25). Dec 58, 9p. 7 refs. Technical rept. PR-88-P.
Order from LC mi$1.80, ph$1.80 PB 148 821

In a program concerned with the mixing of compressible jets with quiescent air, experimental measurements were obtained in which stagnation temperatures along the centerline of the jet (T_c°) were greater than either the uniform initial stagnation temperature of the jet (T_1°) or the ambient temperature (T_a). This effect was most evident when the initial Mach number was the greatest and when the ratio T_1°/T_a was at a minimum (unity for the actual experimental cases).

Lockheed Aircraft Corp., Sunnyvale, Calif.
GENERAL RESEARCH IN FLIGHT SCIENCES. VOLUME I, PART TWO: FLUID MECHANICS. Technical rept. for Jan 59-Jan 60. Jan 60, 203p. 62 refs. LMSD-288139.
Order from LC mi$9.30, ph$31.80 PB 148 399-1

Contents:
Shock-tube experiments simulating entry into planetary atmospheres
A note regarding stagnation-point radiation heat transfer
Formation of nitric oxide behind strong shock waves in air
Steady two-dimensional flow with a transverse magnetic field (LMSD-48 423)
Studies of sputtering by beam technique
Some reflected shock parameters in N_2 and O_2
Stagnation-point heat transfer measurements in hypersonic, low-density flow
Comparative studies of vibrational relaxation in nitric oxide
Charge and magnetic field interaction with satellites
On meteoritic impact
(See also PB 148 399)

Lockheed Aircraft Corp., Sunnyvale, Calif.
GENERAL RESEARCH IN FLIGHT SCIENCES. VOLUME III: FLIGHT DYNAMICS AND SPACE MECHANICS. Technical rept. for Jan 59-Jan 60. Jan 60, 460p. 108 refs. LMSD-288139.
Order from LC mi$11.10, ph$69.60 PB 148 399-3

Contents:
Topological structure of the space of trajectories for the restricted problem of three bodies (LMSD-49 781)
Minimum transfer time for a power-limited rocket (LMSD-49 769)
Fuel requirements for crude interplanetary guidance
On the anomalies in the movement of the perigee due

to oblateness and air drag for critical values of inclination
The local accuracy of doppler orbit determination (LMSD-285 536)
On the motion of a satellite about a planet with rotational symmetry (LMSD-288 067)
Researches in interplanetary transfer (LMSD-285 061)
Mass considerations in ring-supported solar sails
Mechanics problems of spaceflight (LMSD-288 073, AD-231 349)
Spin-induced forced resonant behavior of a ballistic body re-entering the atmosphere
Spin-induced forced resonant behavior of a ballistic body having stable nonlinear aerodynamic properties
Optimization of trajectories
Evaluation of the motion and aerodynamic characteristics of high-fineness-ratio re-entry configurations
(See also PB 148 399-2)

Midwest Research Inst., Kansas City, Mo.
TABLES OF COEFFICIENTS FOR COMPRESSIBLE FLUTTER CALCULATIONS, by Yudell L. Luke. Rept. on Contract AF 33(038)6473. Aug 50, 95p. 34 refs. AF Technical rept. no. 6200; ATI-92 221.
Order from LC mi$5.40, ph$15.30 PB 150 299

This report released for sale to the public 19 Sep 60.

The purpose of this report is to facilitate the work of the analyst determining the flutter characteristics of a system in compressible flow. To date, tables of aerodynamic coefficients for both subsonic and supersonic flow are to be found in a number of widely dispersed sources. As a rule, each source employs a different notation and no consistency exists in the choice of reference axes. Here, all of the existing tables are brought together under a convenient notation and referred to a convenient set of axes. In the incompressible case, the tables published by Smilg and Wasserman are widely used and so their notation and system of reference axes are followed here. The report also includes some tables which are useful if further values of aerodynamic coefficients need be computed. To facilitate such calculations, some of the existing tables have been extended to cover a wider range of values. (Author)

National Research Labs., Ottawa (Canada).
A HEAT-FLUX-METER FOR USE WITH THIN FILM SURFACE THERMOMETERS, by R. F. Meyer. 26 Apr 60, 32p. 4 refs. Aeronautical rept. LR-279.
Order from LC mi$3.00, ph$6.30 PB 149 198

Thin film surface thermometers may be used to measure the heat transfer to a body on which they are mounted if the assumption of one-dimensional heat transfer to the body is made. Generally the interpretation of the surface temperature history to determine the heat transfer requires the numerical evaluation of an integral. This report describes a simple resistance-capacity network which, when used with the thin film thermometer, enables the heat transfer to be recorded directly. (Author)

Naval Ordnance Lab., White Oak, Md.
A SUMMARY OF EXPERIMENTAL MAGNUS CHARACTERISTICS OF A 7 AND 5-CALIBER BODY OF REVOLUTION AT SUBSONIC THROUGH SUPERSONIC SPEEDS, by John E. Greene. 4 Aug 58, 52p. 5 refs. Aerodynamics research rept. 35; NAVORD rept. 6110; AD-219 366.
Order from LC mi$3.60, ph$9.30 PB 147 567

An experimental investigation of the Magnus force and moment characteristics of two different length bodies of revolution at spin rates and angles of attack comparable with full-scale projectiles and rockets was made. Experimental results are presented for a 7-cal length body at Mach numbers from M=0.22, through M=2.46, and for a 5-cal length body at M=0.22, and M=1.75 through M=2.87. In addition, variation of the Magnus characteristics with changes in the nose shape of the 7-cal body at subsonic speeds and the 5-cal body at supersonic speeds are also included. (Author)

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
THE LAMINAR DIFFUSION BOUNDARY LAYER WITH EXTERNAL FLOW FIELD PRESSURE GRADIENTS, by Judson R. Baron and Paul B. Scott. Rept. on Contract AF 49(638)245. Dec 59, 73p. 10 refs. Technical rept. 419; AFOSR-TN-[60-830].
Order from LC mi$4.50, ph$12.30 PB 149 342

An analysis and sample solutions are presented for the two-dimensional laminar boundary layer in the presence of foreign gas injection and a non-uniform external flow field. Similarity restrictions are given and numerical results shown for the case of helium injection into an external air flow at vanishing Mach number. The external flow field is described by a natural extension of the Falkner-Skan "wedge" solutions. Pressure gradients prove to have appreciable effects upon skin friction, heat transfer, and boundary layer separation. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
EXPERIMENTAL INVESTIGATION OF THE DOWNSTREAM INFLUENCE OF STAGNATION POINT MASS TRANSFER, by Paul A. Libby and Robert J. Cresci. Final rept. for 1 July 58-Nov 59 on Solid State Research and Properties of Matter, Contract AF 33(616)5994. Apr 60, 53p. 20 refs. [PIBAL rept. 520] WADC Technical note 59-210; AD-230 766.
Order from OTS $1.50 PB 161 919

Results are presented of an experimental investigation of the downstream influence of localized mass transfer in the stagnation region of a blunt body under hypersonic flow conditions. The coolant is injected through a porous plug coaxial with the center line of symmetry of the model. Tests were carried out in a Mach 6 wind tunnel with stagnation temperatures of approximately 1600°R and with a stagnation pressure of approximately 600 psia. Four different gases were injected over a range of mass flows. Heat transfer on the impermeable section was measured under isothermal wall conditions; for the higher rates of mass flow, adiabatic surface temperatures were also determined. Theoretical analysis of the boundary flow is investigated to establish the similarity parameters for

the flow system. These parameters permit the extrapolation of the test results to other flow conditions provided laminar flow prevails. Helium is found to be the most efficacious coolant. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
TURBULENT HEAT TRANSFER ON BLUNT-NOSED BODIES IN TWO-DIMENSIONAL AND GENERAL THREE-DIMENSIONAL HYPERSONIC FLOW, by Roberto Vaglio-Laurin. Rept. on Aerodynamic Research, Contract AF 33(616)3265. Sep 58, 49p. 22 refs. WADC Technical note 58-301; AD-206 050.
Order from LC mi$3.30, ph$7.80 PB 149 283

Recent results obtained for three-dimensional laminar boundary layers are extended to the turbulent case. It is shown that in the presence of highly cooled surfaces and of moderate Mach numbers of the outer stream, the crossflow and the pertaining Reynolds stresses in a general three-dimensional turbulent boundary layer are negligible even for large transversal pressure gradients. The demonstration assumes that Reynolds analogy is satisfied by the flow in the streamline direction; subsequently, the validity of this assumption is established by extending a correlation due to Mager between-two-dimensional compressible and incompressible turbulent boundary layers. From a study of the transformation and of its implications, a rapid method for the analysis of the boundary layer flow under the subject conditions is established. In the absence of general three-dimensional data, a comparison with experiments and with the predictions of other known analyses is presented for several axisymmetric configurations; the results of the method proposed here exhibit good agreement with the data. The equations governing the mean motion in a general compressible three-dimensional turbulent boundary layer are derived in an appendix. (Author)

Princeton U., N. J.
EXPERIMENTAL MIXING PROFILES OF A MACH 2.6 FREE JET, by Edward T. Pitkin and Irvin Glassman. Rept. on Project Squid, Contract Nonr-1858(25). Aug 58, 10p. 7 refs. Technical rept. PR-83-P.
Order from LC mi$1.80, ph$1.80 PB 146 542

Princeton U., N. J.
NUMERICAL SOLUTIONS OF SHOCK-INDUCED UNSTEADY BOUNDARY LAYERS, by S. H. Lam. Rept. on Contract AF 49(638)465. Aug 59, 41p. 1 ref. Rept. 480; AFOSR-TN-59-926.
Order from LC mi$3.30, ph$7.80 PB 147 265

In the present report, numerical solutions for the shear function $\phi(\alpha, \beta)$ and the Reynolds analogy coefficient Ra are presented. The symbols used here will follow those used in Reference L The calculations were performed on the Wright Field Univac Scientific 1103 digital computor using the Wright Field "CHIP" interpretive system. It was found that the iteration procedure suggested in Reference I was successful in generating solutions of good accuracy for the shear function $\phi(\alpha, \beta)$. However, because of the lack of a suitable "momentum integral correction" procedure, the iteration for the enthalpy function $H(\alpha, \beta)$ was found to be unsatisfactory. (Author)

Princeton U., N. J.
SOME EXPERIMENTAL STUDIES OF THE SEPARATION OF SUPERSONIC TURBULENT BOUNDARY LAYERS, by Seymour M. Bogdonoff. Rept. on Contract AF 18(600)498. June 55, 22p. 28 refs. Rept. no. 336; OSRTN-56-64; AD-81 056.
Order from LC mi$2.70, ph$4.80 PB 150 294

This report released for sale to the public 19 Sep 60.

An experimental study of shock wave turbulent boundary layer interaction, covering a range of geometries and Mach numbers from 1 to 3.85, has been completed. The present paper summarizes the results of a series of some detailed studies and provides a framework which can be used to predict separation, peak pressure ratios, and the pressure ratio before separation over the entire Mach number range. (Author)

Research Labs. for the Engineering Sciences, U. of Virginia, Charlottesville.
AN EXPERIMENTAL STUDY OF THE REDUCTION IN DRAG ON A ROTATING CYLINDER WHEN HELD AT MODERATELY LOW PRESSURES FOR EXTENDED PERIODS OF TIME (THE SOAKING EFFECT), by A. R. Kuhlthau, J. H. Bodine, and J. E. May. Rept. on Contract NOrd-18211. Mar 60, 42p. 4 refs. Rept. no. AST-2849-101-60U.
Order from LC mi$3.30, ph$7.80 PB 148 390

The "soaking effect" is an observed reduction in drag which occurs when the concentric cylinder apparatus is allowed to stand for many hours at reduced pressure. The details of the procedure for observing this effect are clarified. The one real conclusion that can be drawn from this series of experiments is that the so-called "soaking effect" is more complicated than earlier experimentation has indicated. No information is yet at hand which can provide a clear explanation of the drag reduction.

Rome U. (Italy).
SIMILAR SOLUTIONS IN RE-ENTRY LIFTING TRAJECTORIES, by Luigi Broglio. Technical note no. 3 on Contract AF 61(052)198. Dec 59, 35p. 3 refs. SIARgraph no. 54; AFOSR-TN-60-678.
Order from LC mi$3.00, ph$6.30 PB 149 586

This paper deals with the analysis of re-entry trajectories. The two general equations of motion are written down by considering all the external forces, i.e., aerodynamic drag, lift, force of gravity. The equations themselves are then made nondimensional by taking as reference point the one corresponding to the deceleration peak; in this way the ballistic parameter $W/c_D A$ can be eliminated, and the only remaining parameters are the value of deceleration peak, the flight path angle at deceleration peak and the lift/drag ratio. Two important features are to be pointed out: (a) the equations are exact also at high altitudes; (b) the solution, being independent of the body shape, can be considered of an universal character.

Stanford U., Calif.
INFLUENCE COEFFICIENTS FOR RADIATION IN A CIRCULAR CYLINDER, by E. W. Parkes. Rept. on Contract AF 49(638)223. Mar 60, 13p. SUDAER no. 92; AFOSR-TN-60-415.
Order from LC mi$2.40, ph$3.30 PB 148 508

A table of influence coefficients is calculated from which the distribution of absorbed radiation in a long circular cylinder having any distribution of emitted radiation can readily be determined. Lambert's law of diffuse emission and reflection is assumed, and the coefficient of absorbivity is supposed constant. A table of functions for the distribution of reflected radiation after each reflection up to the tenth is also given, so that the results can be compared with non-Lambertian systems. (Author)

Stanford U., Calif.
TOROIDAL SHELLS WITH NONSYMMETRIC LOADING, by W. Flügge and C. R. Steele. Rept. on Contract Nonr-225(16). 1 Oct 59, 95p. 13 refs. Div. of Engineering Mechanics Technical rept. no. 122; AD-229 108.
Order from LC mi$5.40, ph$15.30 PB 149 506

Contents:
Equations for thin shell of revolution
- Equations of equilibrium
- Kinetic relations and Hooke's law
- Evaluation of stress resultants
- Separation of variables
- Fundamental ordinary differential equations

Membrane theory for toroidal shells
- Membrane equations and membrane force solutions
- Inextensional deformation solution
- Deformations due to membrane forces
- Validity of results

Derivation of single equation for shell of revolution
Solution of homogeneous equation
- Edge effect solutions for general non-shallow shell
- Solutions for toroid with edge in shallow region
- Deformations and stress resultants
- Validity of results

Solution of nonhomogeneous equation
- Improved membrane force solution
- Stress resultants and deformation for improved membrane force solution
- Improved inextensional deformation solution
- Stress resultants and deformations for improved inextensional deformation solution
- Improved non-singular membrane force solution for n=1
- Surface loads

Technische Hochschule, Munich (West Germany).
PRACTICAL NUMERICAL METHODS OF THREE-DIMENSIONAL SUPERSONIC FLOW, by Robert Sauer. Technical (Final) rept. on Contract AF 61(514)1080. 1 Mar 60, 33p. 2 refs. AFOSR-TR-60-40.
Order from LC mi$3.00, ph$6.30 PB 149 578

The reported research pertains to the following subjects: Linear supersonic flow (l. s. f.) past slender bodies of arbitrary shape; l. s. f. past wing-body combinations; l. s. f. past oscillating bodies; the "area rule" in l. s. f. ; two dimensional unsteady, non linear flow; investigations on the numerical methods for linear and non-linear supersonic flow equations.

University of Southern California. Engineering Center, Los Angeles.
INVESTIGATION OF CIRCULATION CONTROL, by Philip Lamson and Frederick O. Smetana. Final rept. on Contract NOas-55-498-d. 31 Mar 58, declassified 9 June 58. 49p. 13 refs. USCEC rept. 49-101; AD-205 395.
Order from LC mi$3.30, ph$7.80 PB 147 576

A correlation study of data from various sources has been made to aid in determining how available blowing air can best be applied. It is well established that if the available blowing momentum lies in the boundary-layer-control region, then the best use of this momentum is tangential blowing over a deflected flap. A correlation of existing data reveals that blowing over a flap is superior to trailing edge blowing even when the C_μ lies in the supercirculation region. This fact is explained on the basis of the present experimental results which clearly point out the importance of the "sink effect" mechanism.

Hydrodynamics, Hydraulics, and Hydrostatics

California Inst. of Tech., Pasadena.
UNSTEADY SUPERCAVITATING FLOWS, by T. Y. Wu. Rept. on Contract Nonr-220(28). July 59, 30p. 14 refs. Engineering Div. rept. no. 85-11; AD-225 264.
Order from LC mi$2.70, ph$4.80 PB 147 792

This work is confined to the case in which the flow at infinity is source-free, and hence the cavity volume will remain constant. However, the generalization of this argument to the case of separated flow in air would be open to question; for in this case of one-phase flow, the fluid inside the wake may actually consist of fluid particles originally outside due to the turbulent mixing in the unsteady motion.

California Inst. of Tech., Pasadena.
WATER WAVES GENERATED BY THIN SHIPS, by Milton S. Plesset and T. Yao-tsu Wu. Rept. on Contract Nonr-220(28). Oct 59, 37p. 4 refs. Engineering Div. rept. no. 85-14; AD-229 378.
Order from LC mi$3.00, ph$6.30 PB 149 508

The problem of interest is that of the water waves in a body of water of infinite depth generated by a thin ship of given hull form, moving with constant velocity U along a straight course of the otherwise undisturbed water surface. A particular method is evaluated for computing the velocity field at an arbitrary distance (not too near the ship) fixed in the fluid. A new proposal is made that the hull profile be represented by a double Fourier series with its half-periods spanning over the region occupied by the longitudinal mid-section of the ship. The convergence of this series representation is found to be satisfactorily rapid, especially when the tangent plane of the hull is every-

where continuous. In the latter case the longitudinal slope of the hull, which is the only partial derivative appearing in the analysis, is found in a specific case to be well represented by the partial derivative of the series. With this series representation of the hull, the analysis of the velocity field calculation is greatly reduced so that the final result can be expressed in terms of a combination of several single and double Fourier integrals which are susceptible to numerical methods. (Author)

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
A GENERALIZED THEORY OF THE IMPACT CHARACTERISTICS OF SURFACE-PIERCING, FULLY VENTILATED DIHEDRAL HYDROFOILS, by Peter Ward Brown. Rept. on Contract Nonr-263(20). July 59, 112p. 4 refs. Rept. no. 731; AD-225 740.
Order from LC mi$6.00, ph$18.30 PB 147 801

A theoretical analysis of the fixed-trim impact of a surface-piercing fully ventilated dihedral hydrofoil is presented. A basic differential equation of the motion is obtained based on the assumption that the instantaneous forces are quasi-steady and the same as those on hydrofoil running steadily at the instantaneous values of angle of attack, resultant velocity and draft. Integration of this equation leads to a straightforward method of calculating impact time histories. It is shown that each impact is characterized by an approach parameter, P_O, which depends on the trim and initial glide-path angles only. The chief impact characteristics including the maximum acceleration, elapsed time and draft at maximum acceleration, the maximum draft, and the rebound velocity are obtained as functions of the approach parameter. The analysis is extended to cover partial ventilation impacts as well as a number of special cases, including that of landing at the trim for zero lift in which it is found that the hydrofoil does not rebound after impact. The results of the experimental investigation confirm the theoretical predictions in every particular, both as regards the detailed time histories and the chief impact parameters. (Author)

Institute of Engineering Research, U. of California, Berkeley.
SHIP RESISTANCE IN UNIFORM WAVES AS A FUNCTION OF WAVE STEEPNESS AND BEAM OF THE SHIP, by O. J. Sibul. Rept. on Contract Nonr-222(18). Sep 59, 46p. 8 refs. Series no. 61, issue no. 18; AD-229 496.
Order from LC mi$3.30, ph$7.80 PB 148 617

A 5-foot model of Series 60, block coefficient 0.60, was used as the parent form. Two additional models were similar to the parent except for the beam, which was 0.75 of parent for one model and 1.25 of parent for the other. All of the models were towed in waves 5 feet long at seven different wave steepnesses between 0.0146 and 0.0684. The results indicate that the added resistance coefficient depends upon the beam of the ship, the Froude number, and the steepness of the waves. It has been pointed out that for steeper waves the model has definite speed ranges in which change in thrust would affect very little or not at all the forward speed of the model. The speeds between these particular ranges cannot be achieved in actual tests. An attempt has been made to relate this phenomenon to the discontinuity in damping moment curves as discussed by Havelock (Quarterly Transactions of the Institute of Naval Architecture, London, Vol. 100, no. 2, Apr 58). (Author)

Mellon Inst., Pittsburgh, Pa.
AN APPROXIMATION THEOREM FOR FUNCTIONALS, WITH APPLICATIONS IN CONTINUUM MECHANICS, by Bernard D. Coleman and Walter Noll (Carnegie Inst. of Tech.) Rept. on Contract AF 49(638)541 and National Science Foundation Grant NSF-G 5250. July 60, 35p. 8 refs. AFOSR-TN-60-826.
Order from LC mi$3.00, ph$6.30 PB 149 810

Contents:
Part I. The Approximation Theorem
Influence functions and histories
Retardation
Memory functionals
The approximation theorem
Part II. Applications
The concept of a simple fluid
Approximations of order n for simple fluids
Simple materials in general

Princeton U., N. J.
STATISTICAL EFFECTS RESULTING FROM THE PRESENCE OF MANY PARTICLES IN MOTION IN AN IDEAL FLUID, by Richard L. Peskin. Rept. on Project Squid, Contract Nonr-1858(25). June 59, 23p. 6 refs. Technical rept. PR-92-P.
Order from LC mi$2.70, ph$4.80 PB 146 539

The first approximation to the mutual Bernoulli forces between many particles is calculated for an ideal fluid. A fluctuation analysis on a single particle is performed using a single term approximation to the Bernoulli force. The anti-symmetric effects introduced by the velocity of the particle under consideration and the velocity dependent forces result in a systemic deceleration of the particle unless it has a very small speed in which case a systemic acceleration is observed. (Author)

Princeton U., N. J.
TRANSPORT PROCESSES IN TWO-PHASE TURBULENT FLOW, by Chang-Lin Tien. Doctoral thesis. Rept. on Contract Nonr-1858(25). June 59, 99p. 47 refs. Proj. Squid Technical rept. PR-91-T-R.
Order from LC mi$5.40, ph$15.30 PB 146 572

The basic mechanism of momentum transport in a two-phase flow field, i.e., solid particles in a fluid medium, is further studied as a complement of previous works. A knowledge of the decaying processes of turbulent motion in the solid phase is obtained. Statistical relations are obtained in closed forms such that the correlation, scale and intensity of one phase can be calculated from those of the other phase. The wall interference on the two-phase turbulent motion is discussed.

Statics, Kinematics, and Kinetics

J. G. Engineering Research Associates, Baltimore, Md.
VIBRATIONS OF THICK SHELLS IN A VACUUM AND IN AN ACOUSTIC MEDIUM. PART I. VIBRATIONS OF THICK SHELLS IN A VACUUM, by Joshua E. Greenspon. Technical rept. no. 1 on Contract Nonr-2733(00). Feb 59, 62p. 18 refs.
Order from LC mi$3.90, ph$10.80 PB 145 249

This report discusses the dynamic behavior of thick cylindrical shells. Wave velocities, frequencies, mode shapes, and stress distributions are given for a wide range of physical parameters. The object of this report is to point out some of the characteristics associated with the vibrations of thick shells and contrast these features with those of the thin shell and solid bar. The three dimensional theory of elasticity is used in the analysis. (Author)

Watertown Arsenal Labs., Mass.
BUCKLING CHARACTERISTICS OF CORRUGATED CYLINDERS. PART II. SUMMARY, by Joseph F. Cheatham. July 60, 34p. 2 refs. Technical rept. no. WAL TR 715/3-Pt. 2.
Order from LC mi$3.00, ph$6.30 PB 149 334

In this investigation approximately fifty tests were conducted upon corrugated cylinders. The parameters, which were varied in the tests, were (1) the configuration of the corrugation, (2) the height of the cylinder, (3) the radius of the cylinder, and (4) the material of which the cylinder was fabricated. The buckling data were satisfactorily correlated to existing theories of buckling. (Author) (See also PB 142 430)

METALLURGY

Aviation Gas Turbine Div. [Westinghouse Electric Corp., Lester, Pa.]
DEVELOPMENT OF NIOBIUM-BASE ALLOYS, by Richard T. Begley and William N. Platte. Rept. for 1 June 58-1 June 59 on Metallic Materials, Contract AF 33(616)5754. May 60, 132p. 26 refs. WADC Technical rept. 57-344, Part IV.
Order from OTS $2.75 PB 161 936

Vacuum tensile data were obtained for pure niobium from room temperature to 1371 C (2500 F). The data for niobium followed the general pattern exhibited by other pure refractory metals. The ductile-brittle transition (in impact) for commercial purity, arc melted niobium was close to room temperature. The effect of binary additions of Ti, Zr, Hf, V, Mo, W, Re, Al, and Y on the hardness and workability of niobium was determined. Nb-Ti and Nb-Y alloys had excellent cold workability. Mechanical property data were obtained at room temperature and 1093 C (2000 F) on niobium containing additions of Ti, Zr, Hf, V, Mo, and W. Of the elements studied, vanadium additions were the most effective strengtheners. Nb-Zr and Nb-Hf alloys having high oxygen contents had very good high temperature properties. It appears that the interaction of oxygen with the alloy addition may be responsible for the high strength. Tensile data were also obtained on alloys having ternary and quaternary additions of Ti, Zr, Hf, and Mo. Nb-Ti-Zr-Hf alloys exhibited yield strengths well in excess of 40,000 psi at 1093 C (2000 F). Welding studies on a number of niobium alloys containing additions of Ti, Zr, Hf, V, and W were carried out. Satisfactory welds were obtained in all the alloys studied. Bend test data were obtained on the weld specimens. (Author)

Battelle Memorial Inst., Columbus, Ohio.
ELECTRODEPOSITION OF CHROMIUM ALLOYS AND STUDY OF ELEVATED-TEMPERATURE PROPERTIES OF CERTAIN ELECTRODEPOSITED METALS AND ALLOYS, by P. T. Woodbury, W. G. Hespenheide and others. Technical progress rept. no. 4, 1 Dec 54-1 Feb 55, on Contract NOas-54-706-c. 15 Feb 55, 28p. 13 refs.
Order from LC mi$2.70, ph$4.80 PB 148 736

One of the objectives of the work in this report period was to continue the elevated-temperature oxidation studies of electrodeposited metals in liquid- and vapor-phase molybdenum trioxide. Another objective was to determine the effect of changing the composition of chromium-iron alloy on its coefficient of thermal expansion and permanent change in length after heat treat treatment. Another objective was to determine the expansion and contraction behavior of electrodeposited cobalt-tungsten alloy and of a specimen of stress-free nickel.

Battelle Memorial Inst., Columbus, Ohio.
ELECTRODEPOSITION OF CHROMIUM ALLOYS AND STUDY OF ELEVATED-TEMPERATURE PROPERTIES OF CERTAIN ELECTRODEPOSITED METALS AND ALLOYS, by G. R. Schaer, P. T. Woodberry, and others. Technical progress rept. no. 6, 1 Apr-1 June 55, on Contract NOas-54-706-c. 15 June 55, 21p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 148 737

One of the objectives of the work during this period was to determine whether alternate layers of nickel and chromium plate could be diffused at 100 or 1150 C to form a nickel-chromium alloy. A second objective was to confirm the superiority of stress-free nickel plate over stressed nickel plate as regards denseness after heat treatment. A third objective was to compare the hot hardness of chromium with chromium-iron alloy plates. (See also PB 148 736)

Battelle Memorial Inst., Columbus, Ohio.
ELECTRODEPOSITION OF CHROMIUM ALLOYS AND STUDY OF ELEVATED-TEMPERATURE PROPERTIES OF CERTAIN ELECTRODEPOSITED METALS AND ALLOYS, by G. R. Schaer, J. A. Gurklis and others. Technical progress rept. no. 7, 1 June-1 Aug 55, on Contract NOas-54-706-c. 15 Aug 55, 38p. 11 refs.
Order from LC mi$3.00, ph$6.30 PB 148 738

The objectives of the work during this report period were as follows: (1) to study the density and structure of the diffusion alloy of nickel-chromium electroplates; (2) to measure the oxidation of this diffusion alloy at 980 C in air and in liquid molybdenum trioxide; (3) to compare the changes in density resulting from heat treating nickel-chromium laminate, nickel plate from an all-chloride bath, watts-type nickel, low-contraction chromium, and Crack Free chromium; (4) to apply the diffusion alloy to molybdenum disilicide-coated molybdenum specimens; and (5) to investigate the adherence of chromium-iron alloy plate on steel. (See also PB 148 737)

Climax Molybdenum Co. of Michigan, Detroit.
DEVELOPMENT OF TUNGSTEN-BASE ALLOYS, by M. Semchyshen and R. Q. Barr. Interim rept. no. 2, 1 Jan-30 Apr 59, on Contract NOas-58-847-c. 1 May 59, 18p. AD-217 783.
Order from LC mi$2.40, ph$3.30 PB 149 991

This report released for sale to the public 31 Aug 60.

W-Zr: Elevated-temperature hardness measurements were made on a W-Zr casting which was prepared by vacuum arc-casting a pressed, sintered, and swaged W bar and adding Zr sponge at a uniformly increasing rate. The elevated-temperature hardness increased with Zr content. Comparing data obtained from X-ray intensity measurements with the hardness values indicated that elevated-temperature hardness does not increase linearly with Zr content, but shows less sensitivity to changes in alloy content at the higher Zr levels. W-Ta: Samples of a W-graded Ta heat were subjected to a 1600°F hardness test. The effects of alloying on hardness were more pronounced at 1600°F than at room temperature. Other samples were tested up to 2400°F. The data showed that the hardness values between about 1200° and 2000°F appeared to be changing about linearly with Ta content. Indications were that the curves will tend to merge at higher temperatures. W-Hf: An ingot of W graded with Hf was cast. Slices of the ingot are being cut for test specimens. W-Co: An ingot was cast with an intended Co range from 0 to 5%.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
DESIGN INFORMATION OF NICKEL-BASE ALLOYS FOR AIRCRAFT AND MISSILES, by R. J. Favor, D. A. Roberts, and W. P. Achbach. Rept. on Contract AF 18(600)1357. 20 July 60, 153p. 35 refs. DMIC rept. 132.
Order from OTS $3.00 PB 151 090

Tensile, compressive, shear, and bearing properties of some nickel-base alloys for aircraft and missiles have been assembled and evaluated. Tentative design curves showing the effect of temperature on these properties are presented in a format consistent with the design document, MIL-HDBK-5 (superseding ANC-5) Strength of Metal Aircraft Elements. These data will be reviewed in October, 1960, by the ANC-5 Panel before the design curves, or modifications of them, can be included in MIL-HDBK-5. In addition to the mechanical-property data, background information on these alloys is presented to aid in the selection of alloys for given elevated-temperature applications. (Author)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
METALLURGICAL CHARACTERISTICS OF A-286 ALLOY, by Hiram Brown. [Rept. on Contract AF 18(600)1375]. 26 July 60, 10p. 2 refs. DMIC memo. 59.
Order from OTS $0.50 PB 161 209

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
SELECTED REFERENCES TO ASTIA DOCUMENTS ON MACHINING, by F. W. Boulger and M. B. Gold. [Rept. on Contract AF 18(600)1375] 11 Aug 60, 51p. 133 refs. DMIC memo. 61.
Order from OTS $0.50 PB 161 211

The references were selected from appropriate sections of the Technical Abstract Bulletin prepared by the Armed Services Technical Information Agency (ASTIA). They have been grouped under the following headings: machining practices; tool materials; machining properties (machinability); program-controlled tools; alternate methods of machining; machine tools; metal-cutting phenomena; cutting fluids; automated processes; miscellaneous.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
SELECTED SHORT-TIME TENSILE AND CREEP DATA OBTAINED UNDER CONDITIONS OF RAPID HEATING, by Donald P. Moon and Ward F. Simmons. Rept. on Contract AF 18(600)1375. 17 June 60, 88p. 121 refs. DMIC rept. 130.
Order from OTS $2.25 PB 151 088

This report is a graphical presentation of selected short-time elevated-temperature strength data obtained under conditions of rapid heating. Stress-versus-temperature curves of tensile strength, yield strength, and stress to produce 1 per cent creep strain or rupture in designated times are presented in 64 figures. Data are given for 28 alloys in sheet form, including 3 aluminum alloys, 6 titanium alloys, 2 alloy steels, 3 tool steels, 6 Cr-Ni-Fe alloys, and 8 superalloys of general interest. In addition, an extensive bibliography contains references to 121 reports and articles pertaining to test methods and equipment and to very-short-time data for these and many other materials. (Author)

Illinois U., Urbana.
SOME PROPERTIES OF VANADIUM AT SUBATMOSPHERIC TEMPERATURES, by J. A. Hren, C. M. Wayman, and T. A. Read. Rept. on Contract AF 49(638)420, 15 Sep 59, 9p. 8 refs. AFOSR-TN-59-1003; AD-227 357.
Order from LC mi$1.80, ph$1.80 PB 149 278

The nature of the resistivity-temperature relation and the proposed allotropy in V was investigated. Resistivity measurements were made on Ca-reduced V of 99.7% purity. The specimen and thermocouple were immersed in a Dewar vessel containing isopentane. A constant temperature was maintained for more than sufficient time to make the necessary measurements. Resistance measurements were made on specimens in

the annealed, vacuum-degassed, and cold-worked condition. The results showed no indication of any sudden discontinuity; however, a deviation from linearity existed at about 200°K. The measurements on heating and cooling were in agreement. Young's Dynamic modulus was measured as a function of temperature for polycrystalline specimens of 99.7% purity. No discernible deviation from linearity was apparent. X-ray diffraction studies were conducted through the same temperature range. Results indicated that the suggested allotropy in V appears to be doubtful, at least in the temperature range examined.

Materials Advisory Board, National Research Council, Washington, D. C.
COMMITTEE ON REFRACTORY METALS. VOLUME I. SUMMARY. Rept. on Contract DA 36-039-sc-76436. 15 Oct 59, 40p. Rept. MAB-154-M, vol. I; AD-228 252.
Order from LC mi$3.00, ph$6.30 PB 150 077-1

This report released for sale to the public 31 Aug 60.

Contents:
Raw materials
Extraction processes and capacity
Refractory metals sheet program
Protective coatings
Facilities in the U.S.A. for fabricating mill products of the refractory metals
Alloy development
Chemical analyses
Joining of refractory metals
Basic research in refractory metals

Materials Advisory Board, National Research Council, Washington, D. C.
COMMITTEE ON REFRACTORY METALS. VOLUME II. PANEL REPORTS. Rept. on Contract DA 36-039-sc-76436. 15 Oct 59, 331p. 135 refs. Rept. MAB-154-M(1); AD-234 708.
Order from LC mi$11.10, ph$51.60 PB 150 077-2

This report released for sale to the public 31 Aug 60.

Contents:
Report on the fabrication of refractory metals by non-conventional methods
Report on the joining of refractory metals
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  Report of the raw materials group
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  Report of the raw materials group
  Report of the applications group
Report of the panel on vanadium
  Report of the raw materials group
  Report of the applications group
Report of the panel on rhenium
Report of the panel on the platinum-group metals
(See also PB 150 077-1)

Naval Radiological Defense Lab., San Francisco, Calif.
A RADIOMETRIC METHOD FOR DETERMINING SPECIFIC HEAT AT ELEVATED TEMPERATURES, by C. P. Butler and E. C. Y. Inn. 20 May 58, 27p. 6 refs. Research and development technical rept. USNRDL-TR-235; AD-200 857.
Order from LC mi$2.70, ph$4.80 PB 149 267

The validity of radiometric method for the measurement of specific heat of metals as a function of temperature at elevated temperatures is investigated. The method consists in heating a small specimen of metal by radiation from a carbon arc and then allowing it to cool by radiation to the walls of an evacuated chamber. The specimens are coated with platinum black so that they have an emissivity of 1.0. From the area, mass, and cooling rate, the specific heat at any temperatures below the maximum may be obtained. Six pure metals have been measured and the results compared to the handbook values. (Author)

Office of Technical Services, Dept. of Commerce, Washington, D. C.
PLATINUM AND ALLIED METALS. July 60, 8p. 118 refs. OTS Selective Bibliography SB-420.
Order from OTS $0.10 OTS SB-420

A bibliography of reports listed in the two OTS monthly abstract journals: U.S. Government Research Reports and Technical Translations. Reports listed cover metals, alloys, and compounds of platinum and allied metals (such as palladium, osmium, iridium and rhodium). These include reports added to the OTS collection during the period 1945 to July 1960.

Ferrous Metals

Battelle Memorial Inst., Columbus, Ohio.
AN INVESTIGATION OF THE EFFECTS OF SOLUTE ELEMENTS ON MAGNETOELASTIC DAMPING AND COERCIVITY IN VERY PURE IRON, by R. E. Maringer and G. K. Manning. Summary rept. on Contract Nonr-2606(00). 1 Oct 59, 24p. 16 refs. AD-227 776.
Order from LC mi$2.70, ph$4.80 PB 149 865

Data are presented showing the time and temperature dependence of the damping in zone-melted iron containing small amounts of carbon. The differences in the damping of magnetized and unmagnetized specimens are assumed to represent the magnetoelastic contribution to the damping. The magnetoelastic contribution increases with increasing temperature in the vicinity of the Snoek peak, shifting the temperature and distorting the shape of this peak. At lower temperatures, the damping decreases with time after the removal of an a-c field. The kinetics of this damping

decrease are similar to those of the time-dependent decrease in permeability after demagnetization. Relaxation times calculated for this "magnetoelastic aftereffect" are in excellent agreement with those associated with the interstitial diffusion of carbon in alpha iron. Measurements of the temperature dependence of the induced voltage in a transformer-type apparatus have revealed a sigmoidal increase in the induced voltage with increasing temperature. This increase is apparently related to the temperature-dependent increase in magnetoelastic damping, and calculated relaxation times indicate that the interstitial diffusion of carbon is responsible. (Author)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
TURNING OF HIGH-STRENGTH STEELS IN THE HARDNESS RANGE OF 330 TO 560 BRINELL, by C. T. Olofson. [Rept. on Contract AF 18(600)1375]. 15 July 60, 44p. 34 refs. DMIC memo. 58.
Order from OTS $0.50 PB 161 208

This report contains information and data on the turning of steels of hardness levels up to 560 Brinell. The problems of machining these steels are minimized if rigidity of machine, tool, and workpiece, and adequate power to maintain cutting speed exist throughout cutting. The proper selection of feeds, speeds, and depths of cut appropriate to recommended tool materials and designs are important for adequate tool life and metal removal rates.

Naval [Weapons Lab.] Dahlgren, Va.
METHOD FOR DETERMINING CRACK EXTENSION FORCE Gc IN HIGH STRENGTH STEEL SHEETS AND PLATES: TESTS OF HOMOGENEOUS AIRCRAFT ARMOR PLATE 1/8 INCH THICK, by H. E. Romine. July 58, 10p. 3 refs. NPG Technical memo. no. T-22/58.
Order from LC mi$1.80, ph$1.80 PB 150 144

This report released for sale to the public 12 Sep 60.

The primary objective was the development of a test for determining Gc of steel sheets about 7/64 inch thick and having a hardness of about 45 R_C. This is a progress report on procedures for testing flat sheet or plate material (tests on curved specimens may require more complex loading).

Rodman Lab., Watertown Arsenal, Mass.
THEORETICAL AND PRACTICAL ASPECTS OF VACUUM INDUCTION MELTING OF HIGH-STRENGTH STEELS, by Philip S. Schaffer. Rept. on Industrial Preparedness Measure. Mar 60, 74p. 13 refs. Rept. no. RPL 10/17.
Order from OTS $2.00 PB 161 928

Optimum vacuum induction melting, refining, casting and solidification procedures are employed to develop methods of improving general quality and, in particular, obtaining mechanical properties heretofore unattainable in high-strength 4340 steel castings. Theoretical considerations of crucible-melt reactions, deoxidation, desulfurization, degassification, dissociation and volatilization are applied to the conduct of vacuum heats. It is seen herein that utilizing vacuum induction technology to reduce residual gas content and decrease nonmetallic inclusions, ductility and toughness, especially at the ultra high-strength levels, are substantially improved in vacuum melted steels over conventional air melting procedures. (Author)

Light Metals

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
A STUDY OF THE STRAIN-HARDENING AND CUMULATIVE DAMAGE BEHAVIOR OF 2024-T4 ALUMINUM ALLOY IN THE LOW-CYCLE FATIGUE RANGE, by Richard D'Amato. Rept. for 1 Jan-31 Dec 59 on Mechanics of Flight, Contract AF 33(616)3310. Apr 60, 108p. 19 refs. WADD Technical rept. 60-175.
Order from OTS $2.50 PB 161 905

An experimental fatigue investigation in the range of life between 1 and 10000 cycles to failure was conducted with a series of round tapered specimens of 2024-T4 aluminum alloy. The specimens had a minimum diameter of 0.356 inch and a maximum diameter of 3/4 inch with taper radii of 1 1/2, 0.6 and 0.3 inch. Cycling tests were carried out between limits of local strain based upon the change in diameter at the minimum section or strain across the specimen based upon the change in length of the tapered section. Fatigue data for each of the three specimen types can be represented by two straight line segments when range of strain was plotted against cycles to failure on log-log scales. One line segment covered the life range 4 to 1000 cycles and the other above 1000 cycles. When the data for each of the configurations was normalized with respect to its local strain at failure in a static tensile test, all of the data was represented by the same two straight line segments. Using data from the literature for the endurance range above 10000 cycles to failure, the entire fatigue range from 1 to 10^7 cycles to failure was discussed. The fatigue behavior at zero mean strain of the 0.6 inch radius specimens in terms of range of local strain is directly related to that determined by cycling the specimens between fully reversed limits of strain across the specimen. The strain-hardening behavior of the three configurations were compared and effects of mean strain and rate of straining were considered. The relationship between the appearance of the fracture surfaces and the endurance of the specimens was discussed. (Author)

National Bureau of Standards, Washington, D. C.
INVESTIGATION OF BEARING CREEP OF TWO FORGED ALUMINUM ALLOYS, by Leonard Mordfin, Nixon Halsey, and Philip J. Granum. Aug 60, 22p. 8 refs. Technical note 55.
Order from OTS $1.00 PB 161 556

Fourteen bearing specimens of 7075-T6 and 2014-T6 forged aluminum alloys were tested in creep at 400° F. The 2014-T6 specimens had greater creep resistance and less ductility than the 7075-T6 specimens. For each material the bearing creep resistance varied directly with edge distance and bolt tight-

ness. Prior exposure of the 2014-T6 alloy to elevated temperature reduced its bearing creep resistance. The validity of a previously proposed theory of creep in bolted joints was examined using the test data together with results from an earlier study. The theory was found to hold for 7075-T6 but not for 2014-T6. (Author)

Watertown Arsenal Labs., Mass.
MECHANICAL PROPERTIES OF TITANIUM ALLOYS AS A FUNCTION OF HEAT TREATMENT AND SECTION SIZE, by Charles F. Hickey, Jr. July 60, 61p. 1 ref. WAL TR 405.2/7.
Order from OTS $1.75 PB 161 799

The mechanical properties of 6Al-4V, 6.5Al-3Mo-1V, and 6Mo-3Al titanium alloys were obtained as a function of section size and heat treatment. Sections of 2-, 3-, 4-, and 6-inch diameter rounds were studied, with each alloy being subjected to two solution temperatures, followed by three aging temperatures. Tensile and impact data were obtained in all cases. As a result of the findings, optimum heat treatment for the investigated conditions were established for each alloy. Other factors, such as specimen location, directionality, and microstructure, are discussed. (Author)

Structural Metallurgy and Corrosion

British Non-Ferrous Metals Research Association.
THE PROPERTIES OF GRAIN BOUNDARIES. Annual technical rept. no. 1 to 30 Apr 60 on Contract DA 91-591-EUC-944. May 60, 21p. 10 refs.
Order from LC mi$2.70, ph$4.80 PB 149 431

An investigation is being carried out on the effect of such variables as alloy content, applied stress and temperature on the time dependent sliding of two grains at a common plane grain boundary in bicrystal specimens and also on the creep of crystalline material in single crystals, of copper and dilute copper based alloys.

Crucible Steel Co. of America, Syracuse, N. Y.
DEVELOPMENT OF A DUCTILE, OXIDATION-RESISTANT AND HIGH STRENGTH SINGLE-PHASE (AUSTENITIC) ALLOY BASED ON Fe-Al-Mn-C SYSTEM, by R. C. Gibson. Bimonthly progress rept. no. 3, 15 Feb-15 Mar 60, on Contract NOas 60-6025-c. May 60, 11p.
Order from LC mi$2.40, ph$3.30 PB 148 785

Studies performed on an Fe-Al-C-Mo-W-V base alloy containing additions of nickel and copper indicated that copper lowered stress-rupture properties and improved oxidation resistance. Nickel additions increased stress rupture and room temperature tensile properties of the base alloy but had little effect on oxidation resistance. (Author) (See also PB 148 003)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
STRESS-CORROSION CRACKING OF Ti-5Al-2.5 Sn, by Hiram Brown. [Rept. on Contract AF 18(600)1375] 4 Aug 60, 14p. DMIC memo. 60.
Order from OTS $0.50 PB. 161 210

A large number of unexplained cracks were encountered in the fabrication of complex assemblies of Ti-5Al-2.5Sn. These were not the usual stress cracks, but, instead, consisted of regular families of cracks in certain areas. Laboratory investigation and a survey of technical literature indicated that the cracking was similar to stress-corrosion cracking due to chlorides. In order to see whether stress-corrosion cracking as a result of residual trichloroethylene could take place during heat treating, a series of tests was performed.

Manufacturing Labs., Inc., Cambridge, Mass.
RESEARCH AND DEVELOPMENT ON THE EFFECTS OF HIGH PRESSURE AND TEMPERATURE ON VARIOUS ELEMENTS AND BINARY ALLOYS, by J. S. Harvey, L. Kaufman and others. Rept. for 1 July 58-30 Sep 59 on Metallic Materials, Contract AF 33(616)5996. Apr 60, 99p. 17 refs. WADC Technical rept. 59-655.
Order from OTS $2.25 PB 161 920

High-pressure high-temperature apparatus capable of subjecting test specimens to 100,000 atmospheres at temperatures above 1500°C was designed and constructed. High hydrostatic pressure lowers the temperature of martensitic transformations in Fe-Ni alloys and expands the temperature range of the gamma loop in the Fe-Ni system. The precipitation hardening process in both Al-Cu and Cu-Be alloys is inhibited and modified when carried out at high hydrostatic pressure. The use of pressure during heat treatment of various steels results in transformation products different in structure from those normally obtained, and also retards the temperature reactions. High-pressure high-temperature processing of the Pt-C, Pd-C, and Ni-C systems results in the formation of a new phase. Preliminary experiments indicate that the Ti-N phase diagram is significantly modified by pressure. (Author)

Michigan U., Ann Arbor.
THE EFFECTS OF STRAIN ON THE INTERFACIAL ENERGIES OF SOLIDS, by S. Floreen, E. E. Hucke and D. V. Ragone. Rept. on [Contract AF 49(638)422] 9 Nov 59, 17p. 25 refs. AFOSR-TN-59-1253; AD-233 780.
Order from LC mi$2.40, ph$3.30 PB 146 740

Surface energy and the grain boundary energy of a solid changes with the elastic strain in the following manner;

$$f^S = f^S_o + k\epsilon^2$$

$$f^G = f^G_o + j\epsilon^2.$$

Paint Lab., Mare Island Naval Shipyard, Vallejo, Calif.
EVALUATION OF TEFLON (TETRAFLUOROETHYLENE RESIN) AS A PROTECTIVE COATING AND DRY LUBRICANT FOR SHIPS' SURFACES, by John R. Saroyan. Rept. on Protective Coatings for Ships. 26 Aug 55, 37p. 5 refs. Mare Island Test no. 346.
Order from LC mi$3.00, ph$6.30 PB 148 857

This report released for sale to the public 29 Aug 60.

Several hundred bearing and friction surfaces of various submarine parts were successfully coated with Teflon (tetrafluoroethylene resin). Preliminary results for short period use has indicated excellent performances. Such Teflon coated parts operate freely and show no evidence of salt deposition when subject to seawater. (Author)

Rock Island Arsenal Lab., Ill.
THE EVALUATION OF PETROLEUM BASE RUST PREVENTIVES BY LONG TERM EXPOSURE AND ACCELERATED LABORATORY TESTS. ADDENDUM I. RESULTS AFTER TEN YEARS OF EXPOSURE, by Van Y. S. Hong. 5 Feb 60, 42p. 23 refs. Technical rept. 60-325.
Order from LC mi$3.00, ph$6.30 PB 146 993

Machine gun bolts with specially prepared surfaces were coated with eleven materials including three noninhibited and eight inhibited petroleum base rust preventives and were exposed to three types of simulated field service conditions. At specifiec time intervals covering a period of ten years, the coated bolts were removed, decoated, and evaluated. At the end of ten year test period, analysis of the results indicated that suitable rust preventive materials may be selected for specific time and type of exposures. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Virginia U., Charlottesville.
PHOTONEUTRON CROSS SECTIONS OF COBALT AND MANGANESE, by P. A. Flournoy, R. S. Tickle, and W. D. Whitehead. Technical note on Contract AF 49(638)176. June 60, 22p. 21 refs. AFOSR TN-60-658; AD-238 123.
Order from LC mi$2.70, ph$4.80 PB 148 343

The total photoneutron yields of Mn^{55} and Co^{59} have been carefully measured from threshold to approximately 30 Mev. Analysis of these data using the Leiss-Penfold matrix indicates that the cross sections for both elements show a splitting in the giant resonance region in accord with the predictions of the classical hydrodynamic model. The Mn^{55} peaks occur at energies of $16.8 \pm .25$ Mev and $19.75 \pm .25$ Mev corresponding to cross sections of 90 mb and 77 mb respectively. Co^{59} maxima occur at $16.75 \pm .25$ Mev and $18.75 \pm .25$ Mev with cross sections of 109 mb and 92 mb. The cross sections $\sigma(\gamma,n) + \sigma(\gamma,2n) + \sigma(\gamma,np) + \ldots$ integrated to 25 Mev are 627 Mev-mb for Mn^{55} and 709 Mev-mb for Co^{59}. Breit-Wigner resonance lines were fitted to both cross sections and the intrinsic quadrupole moments determined from these fits are $+.78 \pm .10$ barns for manganese and $+.76 \pm .11$ barns for cobalt. (Author)

Elementary Particles

Cambridge U. (Gt. Brit.)
SINGLE PARTICLE SINGULARITIES IN SCATTERING AND PRODUCTION AMPLITUDES, by J. Gunson and J. G. Taylor. Technical scientific rept. no. 5 on Contract AF 61(052)233. Jan 60, 20p. 12 refs. AFOSR-TN-60-278; AD-234 216.
Order from LC mi$2.40, ph$3.30 PB 147 619

A proof of analyticity properties in momentum transfer of the amplitude for certain physical processes is given here. In particular we justify the use of extrapolation in the scattering angle, at a fixed energy, to obtain the pion- nucleon coupling constant from photoproduction data, for photon laboratory energies up to 1BeV. This extrapolation procedure to obtain strange particle parities and coupling constants is also justified for certain strange particle production and scattering processes. (Author)

Cambridge U. (Gt. Brit.)
UNSTABLE PARTICLES IN A GENERAL FIELD THEORY, by J. Gunson and J. G. Taylor. Technical scientific note no. 6 on Contract AF 61(052)233. Feb 60, 12p. 6 refs. AFOSR-TN-60-679.
Order from LC mi$2.40, ph$3.30 PB 149 587

The problem of unstable particles in quantum field theory is treated as one of the interpretation of complex singularities appearing in the analytic continuation of scattering amplitudes into unphysical sheets of their Lorentz invariant variables. Suitable continuations are shown to hold under certain restrictive assumptions in a general field theory, making use of unitarity and causality of the S-matrix. The extra singularities appearing in the continuation are fixed isolated poles, in accordance with a conjecture of Peierls. (Author)

Institute of Theoretical Physics, Stanford U., Calif.
QUENCHING OF MAGNETIC MOMENTS IN NUCLEI, by S. D. Drell and J. D. Walecka. Technical note no. 19 on Contract AF 49(638)388. June 60, 42p. 15 refs. Technical note 388-19; AFOSR-TN-60-714.
Order from LC mi$3.30, ph$7.80 PB 149 575

Starting from the premise that with modern dispersion-theoretical techniques one has a reliable method for calculating the anomalous magnetic moment of a nucleon, the modification or "quenching" of this moment has been calculated for a nucleon in nuclear metter. The effect considered here is due to the fact that nucleons are not allowed by the exclusion principle

to recoil into states already occupied by other nucleons in the nucleus. The actual technique used in the calculation is to sum all the Feynman diagrams that are included in the dispersion theory calculation of the single nucleon moment. The nucleon propagator is then written as a sum over states and those states are removed in which the nucleon is inside the Fermi sea. The result is that the anomalous moment is reduced by by $\approx 7\%$. (Author)

Johns Hopkins U., Baltimore, Md.
AUGER RATE IN μ MESIC ATOMS, by A. Pevsner, R. Strand and others. Rept. on Contract AF 18(603)143. May 60, 10p. 24 refs. AFOSR-TN-60-463.
Order from LC mi$1.80, ph$1.80 PB 148 957

A study has been made of the K Auger transitions in the light elements of nuclear emulsions. Of 3382 stopping μ-mesons, 1016 were observed to decay. 5 of these had associate short-range electrons whose energies were consistent with the K transitions of CNO. 2 of these 5 are attributed to the K Auger transitions of CNO, while the remaining 3 are attributed to higher Auger transitions in AgBr.

Johns Hopkins U., Baltimore, Md.
THE MASS OF THE Λ^{o} HYPERON, by J. Lodge, F. Anderson and others. Rept. on Contract AF 18(603)143. May 60, 9p. 9 refs. AFOSR-TN-60-462.
Order from LC mi$1.80, ph$1.80 PB 148 956

The mass of the Λ^{o}-hyperon has been measured using nuclear emulsions: $M_{\Lambda} = 1115.55 \pm 0.15$ Mev. (Author)

Miami U., Coral Gables, Fla.
INTERACTIONS AND DECAY OF HYPERONS PRODUCED IN K^{-} CAPTURE STARS AT REST, by M. Blau, C. F. Carter, and A. Perlmutter. Rept. on Contract AF 49(638)97. 31 May 60, 46p. 24 refs. AFOSR-TN-60-745.
Order from LC mi$3.30, ph$7.80 PB 149 332

The results of an investigation of hyperon interactions and decays are presented. Several inelastic interactions are described. The mean free path for nuclear interactions of charged Σ hyperons in emulsion is found to be 11 ± 4 cm in the energy range 10 - 200 Mev.

National Bureau of Standards, Washington, D. C.
SINGLE SCATTERED NEUTRONS FROM AN ISOTROPIC POINT SOURCE, by E. R. Mosburg, Jr. and W. M. Murphey. July 60, 11p. 4 refs. Technical note 63.
Order from OTS $0.50 PB 161 564

A calculation was made to determine the number of particles from an isotropic source which will reach a detector after scattering once in the medium surrounding the detector and source. The simple result obtained is applicable when the separation of the detector and the source is much less than the mean free path of the particle in the medium. The particular case of 14.1 Mev neutrons in air was considered. It was found that 44 percent of the single scattered neutrons had scattering angles of less than 30 degrees. (Author)

Instruments and Installations

Battelle Memorial Inst., Columbus, Ohio.
EXPERIMENTAL AND RESEARCH WORK ON NEUTRON DOSIMETRY, by H. C. Gorton, O. J. Mengali and others. Quarterly progress rept. no. 3, 15 Nov 59-14 Feb 60, on Contract DA 36-039-sc-78924. 15 Feb 60, 30p.
Order from LC mi$2.70, ph$4.80 PB 149 378

The effects of dose rate on the sensitivity to fast-neutron radiation of the experimental silicon-rectifier dosimeters were compared by exposing two sets of units to like amounts of radiation from the General Atomic TRIGA Reactor and the Battelle Research Reactor No significant dependence of device characteristics on the rate of irradiation was observed. In addition, valuable information was obtained on radiation-induced changes in lifetime and, consequently, on the current-voltage characteristics of the experimental units. Two types of read-out circuits have been developed, one of which employs the radiation-induced change in forward current at a fixed voltage and the other radiation-induced changes in lifetime. (See also PB 147 981)

Convair, Fort Worth, Tex.
CALIBRATION OF STANDARD 50 CC AND 900 CC IONIZATION CHAMBERS, by C. F. Malone and V. M. Davis, Rept. on [Contract AF 33(038)21117]. 8 Mar 54, 31p. MR-N-34; CVAC-255T.
Order from LC mi$3.00, ph$6.30 PB 149 993

This report released for sale to the public 13 Sep 60.

The calibration of eight 50-cc and eight 900-cc ionization chambers and their related electrometers is described. Data charts are included which show electrometer readings as functions of electrode voltage changes, percent collection of ions as a function of field strength, electrometer response--a function of pressure in the ion chamber, directional properties of ionization chambers, and dose rate as a function of source-detector separation distance.

Naval Radiological Defense Lab., San Francisco, Calif.
A SIMPLIFIED FILM DOSIMETER FOR FISSION NEUTRONS, by S. W. Ross and E. Tochilin. 4 Apr 58, 23p. 19 refs. Research and development technical rept. USNRDL-TR-224.
Order from LC mi$2.70, ph$4.80 PB 150 147

This report released for sale to the public 12 Sep 60.

A film dosimeter technique has been developed for fast neutron monitoring of reactor personnel. The method takes advantage of the rapid build-up of ther-

mal neutrons when fast neutrons are allowed to penetrate a hydrogenous moderator. The badge consists of a 3/4-inch thick polyethylene frontpiece that is worn on the belt against the body. A combination of silver and tin filters are matched so as to produce equal film blackening from either x- or gamma-rays. Fast neutron exposure is determined from film blackening under radioactive silver produced by capture of the moderated neutrons. The badge contains a sensitive gamma-ray dosimeter film together with a nuclear track emulsion. The dosimeter film serves as both a fast neutron and gamma-ray dosimeter. The nuclear emulsion is read whenever an overexposure is indicated or under any other conditions were a more accurate evaluation of the fast neutron dose is warranted. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
THEORETICAL ANALYSIS OF RADIOMETER PERFORMANCE, by H. G. Ferris. 13 Jan 59, 17p. 1 ref. Research and development technical rept. USNRDL-TR-311, AFSWP-1119; AD-216 542.
Order from LC mi$2.40, ph$3.30 PB 148 850

A theoretical analysis of the thermal behavior of water-cooled thin foil radiometers is carried out. The expression for the heat balance in the circular foil of the radiometer is derived. The steady state solution, $T/t = 0$, subject to certain boundary conditions, yields an expression for thermal sensitivity. This relationship when applied to the three radiometers in common use at NRDL indicates that they operate linearly over their entire ranges (0 to 10, 0 to 50, and 0 to 100 Cal/cm^2) with a maximum error of 2 percent when maximum irradiance is incident on the foil. Solving the heat balance equation, subject to the same boundary, conditions, by means of the Laplace Transformation, an expression for reaction time results: $\tau = \frac{0.416R^2}{\kappa}$

Applying this relationship to the three NRDL instruments yields reaction times of 0.016, 0.004, and 0.004 sec, respectively. (Author)

Nuclear Engineering and Power

Convair, Fort Worth, Tex.
AN ELECTROPLATED NEUTRON THERMOPILE FOR THE 3-Mw GTR, by F. P. Harmon. Rept. on Contract AF 33(600)32054. 20 Feb 59, 27p. 3 refs. NARF-59-20T; MR-N-226.
Order from LC mi$2.70, ph$4.80 PB 150 016

This report released for sale to the public 25 Aug 60.

A neutron-sensitive thermopile which utilizes an electroplating technique for making thermoelectric couples has been developed. This technique offers improved flexibility in design at reduced cost in that it eliminates the usual soldered or welded couples. The thermopile described in this report was constructed for use in the Ground Test Reactor. It consists of a large number of equally spaced junctions extending the length of the reactor core. The signal output is therefore proportional to the integral of the thermal flux distribution along the length of the thermopile. Other features of the thermopile include (1) 100 B^{10}-coated hot junctions and 100 bare cold junctions positioned for ambient-temperature compensation; (2) sensitivity of 10 microvolts per kilowatt reactor power at 2.5 inches from the reactor face; and (3) a time constant of less than one second. Methods used in determining the characteristics of the thermocouple are described in an appendix. (Author)

Nuclear Radiation Lab., U. of Illinois, Urbana.
THE MAGNETIC FIELD PROGRAM FOR THE UNIVERSITY OF ILLINOIS SPIRAL RIDGE CYCLOTRON, by J. O. Ballance, J. L. Friedes and others. Status rept. Technical rept. no. 11 on Contract Nonr-1834(05). Oct 59, 34p. 5 refs. AD-233 131.
Order from LC mi$3.00, ph$6.30 PB 149 476

As soon as the first measurements were analyzed, it was discovered that the magnetic field of the cyclotron was radically different from the expected shape. Efforts were then directed towards the design of a correction coil which would correctly shape the magnetic field. Extensive measurements were made in this connection. This report correlates the data gathered from these measurements and sets forth the techniques developed for the measurements. (Author)

Nuclear Reactions

Naval Radiological Defense Lab., San Francisco, Calif.
DETERMINATION OF Np^{239}, "TOTAL FISSIONS", Mo^{99}, AND Ce^{141} IN FISSION PRODUCT MIXTURES BY GAMMA-RAY SCINTILLATION SPECTROMETRY, by L. D. McIsaac. 5 Jan 56, 17p. 8 refs. Research and development technical rept. USNRDL-TR-72.
Order from LC mi$2.40, ph$3.30 PB 150 146

This report released for sale to the public 12 Sep 60.

A gamma-ray scintillation spectrometric method, involving no other chemistry than sample dissolution, has been developed for the rapid determination of Np^{239} and "Total Fissions" in fission-product samples. A single channel NaI(T1) scintillation spectrometer was used, and analysis required about 1 hour. The 140-Kev gamma-rays of Tc^{99m} and Ce^{141} were used while the 105-Kev gamma ray plus conversion X ray accompanying the decay of Np^{239} was employed to measure the Np^{239} concentration. Determination of the disintegration rates of Mo^{99}, Tc^{99m} and Ce^{141} is also possible by this technique. An accuracy of about 10 per cent or better can be obtained. (Author)

Pennsylvania U., Philadelphia.
STUDIES IN PHOTONUCLEAR REACTIONS, by J. Halpern, K. Geller and others. Annual rept. on Contract AF [49](638)454. June 60, 193p. 93 refs. AFOSR-TN-60-889; AD-239 360.
Order from LC mi$8.70, ph$30.30 PB 149 006

A summary is given of research on neutron separation energies and betatron energy calibration; photoactiva-

tion studies of carbon and oxygen; and inelastic scattering of electrons from nuclei.

Vienna U. (Austria).
THE SIGMA-NEUTRON INTERACTION, by G. Eder. Scientific note no. 2 on Contract AF 61(052)265. 23 Nov 59, 5p. 1 ref. AFOSR-TN-60-25; AD-232 068.
Order from LC mi$1.80, ph$1.80 PB 146 713

The potential between a Σ-particle and a neutron due to exchange of pions is calculated in a static theory. A strangeness and isobaric spin conserving interaction is considered. Second and fourth order terms in the coupling constant are evaluated. It can be shown, that the singlet spin potential is more attractive than the triplet spin potential, in agreement with some experimental evidence. (Author)

Radioactivity

Air Force Special Weapons Center, Kirtland AFB, N. Mex.
SCATTERED GAMMA RADIATION MEASUREMENTS FROM CO^{60} CONTAMINATED FIELD, by Clayton L. Schlemm, Alexander E. Anthony, Jr. and Zolin G. Burson. Jan 59, 126p. 15 refs. AFSWC-TN-59-6; AD-232 439.
Order from LC mi$6.30, ph$19.80 PB 149 987

This report released for sale to the public 31 Aug 60.

A 90° sector of a circle of 604-ft radius was contaminated with cobalt-60 point sources to an approximate level of 1.72 millicuries psf. as a means of simulating an area approaching an infinite contaminated field. Radiation measurements were made in an open hole with a PDR-27A radiac instrument and Dupont 553 film to determine the percentage of the total radiation which is due to scattered radiation (skyshine). It was found to be approximately $10 \pm 4\%$. These measurements were made at selected points from approximately 36 in. above to 25 in. below ground level. Data were obtained in a miniature basement to determine the attenuation of the skyshine by various thicknesses of concrete on the roof. Additional data were obtained to determine the energy of the scattered radiation as a function of the angle above the plane, using a total absorption gamma spectrometer. The unshielded effective energy for dose considerations ranged from 0.90 to 0.12 mev for elevation angles from 10° to 80° above the plane. (Author)

Defense Atomic Support Agency, Washington, D. C.
HIGH ALTITUDE SAMPLING PROGRAM (HASP), SPECIAL REPORT, by Albert K. Stebbins, III. 1 June 60, 244p. 29 refs. DASA 532B.
Order from OTS $3.50 PB 161 916

This report outlines the results of the HASP program in its effort to determine the role played by the stratosphere in the world-wide distribution of radioactive fallout from nuclear weapons tests. The sampling network has collected 10^8 standard cubic feet of air from 57°S to 71°N up to 70,000 feet. Stratospheric inventories of Sr-90 have been calculated for the periods November 1957 to December 1958, January to August 1959, and September to November 1959 to be respectively 0.95, 0.81, and 0.7 megacuries. Concentrations have been greater in the Northern Hemisphere by a factor of 2 or 3 over the Southern Hemisphere. The Sr-90 maximum occurs in the equatorial regions around 90,000 feet and slopes down to around 70,000 feet in the polar regions. A semi-empirical application of Gaussian diffusion is described which suggests that hot clouds injected in the equatorial stratosphere spread in the North-South direction with mixing coefficients near 5×10^8 cm^2/sec. An Injection-Depletion model is offered which indicates that as much as 50% of the material produced in a megaton ground surface burst comes down in local fallout. Removal from the stratosphere occurs at different rates depending on altitude and latitude of injection and season of the year. Surface concentrations of Sr-90 are displayed as a function of latitude and time.

Institute of Engineering Research, U. of California, Berkeley.
PREDICTION, MONITORING AND ESTIMATION OF RADIOLOGICAL FALLOUT PATTERNS FOR CIVIL DEFENSE, by A. Broido, R. R. Read, and R. W. Shephard. Rept. on Civil Defense Research Project, Contract CD-SR-58-40. 1 Aug 59, 38p. 20 refs. Series no. 2, issue no. 17.
Order from LC mi$3.00, ph$6.30 PB 150 014

This report released for sale to the public 15 Sep 60.

This report describes, without technical details, the theoretical and computational bases of a probabilistic approach to prediction, monitoring, and estimation of radiological fallout patterns. The approach can lead to the design of a monitoring system for the quantitative assessment of the completed fallout distribution in which the patterns can be obtained to a specified accuracy with fewer monitoring locations than would be required for the purely empirical approach of graphic interpolation between observations.

Institute of Engineering Research, U. of California, Berkeley.
TECHNIQUE FOR DESIGNING AND EMPLOYING A RADIOLOGICAL MONITORING SYSTEM FOR THE EVENT OF ATTACK, by Robert R. Read. Interim rept. on Civil Defense Research Project, Contract CD-SR-58-40. 10 Apr 59, 30p. 2 refs. Series no. 2, issue no 22.
Order from LC mi$2.70, ph$4.80 PB 150 015

This report released for sale to the public 15 Sep 60.

This report presents a method for estimating fallout iso-intensity contours on the basis of ground monitored radiological measurements and of a probabilistic model describing the behavior of such measurements. This method can be used either for interpolation among several measurements or for the "downwind" prediction of additional hazardous areas where fallout has not yet occurred. Using such an estimation procedure as a basis, the report describes a technique for determin-

ing what radiological measurements are necessary for a ground monitoring system, including the specification of which regions are to be monitored. (Author)

National Bureau of Standards, Washington, D. C.
CALIBRATION OF FIVE GAMMA-EMITTING NUCLIDES FOR EMISSION RATE, by J. M. R. Hutchinson. Aug 60, 23p. 14 refs. Technical note. no. 71.
Order from OTS $0.75 PB 161 572

Mercury-203 and niobium-95 were calibrated by a $4\pi\beta$-γ coincidence method for γ-emission rate, zinc-65 by comparison with the 1.12 Mev peak of scandium-46, sodium-22 by a γ-annihilation-quanta coincidence method and by a triple coincidence method, and strontium-85 by x-γ coincidence counting. The accuracy of the calibration in all cases was $\pm$ 2%. The half-life of the isomeric state of rubidium-85 was measured and found to be 0.98 microseconds. (Author)

Naval Civil Engineering Lab., Port Hueneme, Calif.
LITERATURE SURVEY OF CONCRETES FOR NUCLEAR RADIATION SHIELDING, by Meldon Merrill and W. L. Cowell. Final rept. 28 June 60, 29p. 41 refs. Technical rept. 084.
Order from OTS $0.75 PB 161 910

A survey was made to determine the extent of knowledge about materials used as aggregates in concrete. Information is presented on (1) mix designs incorporating various types of heavy aggregates, (2) available cost data relating to construction methods and aggregates, (3) problems associated with heavy concretes during construction, and (4) nuclear shielding properties for concretes. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
NOMOGRAM FOR RADIOACTIVITY IN GROSS FISSION PRODUCT ANALYSES, by M. H. Rowell and E. C. Freiling. 22 May 57, 6p. Research and development technical rept. USNRDL-TR-159; AD-139 583.
Order from LC mi$1.80, ph$1.80 PB 149 266

A nomogram is presented which facilitates calculations involving the age and size of fission product samples and the fission yields, half lives, and residual activities of the individual fission product nuclides. Although all important fission products of half-life greater than 1 hr are conveniently indicated, the nomogram is applicable to many more. (Author)

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

New York U. Coll. of Engineering, N. Y.
DEVELOPMENT OF TECHNIQUES FOR THE EVALUATION OF HIGH ALTITUDE PRESSURE SUITS, by Renato Contini, Rudolfs Drillis, and Lawrence Slote. Rept. on Human Engineering Evaluation for Pressure Suits, Contract AF 33(616)3592. Dec 59, 130p. 115 refs. WADC Technical rept. 58-641.
Order from OTS $2.75 PB 161 899

The principal purpose of this study is to develop objective criteria to facilitate the selection of that pressure suit or component which permits the operator maximum function. A secondary purpose is to make available to the manufacturer of the suit or component objective data from which he may improve the design of the item. The techniques and methodologies associated with biomechanics were studied for their application to pressure-suited personnel. Physiological and psychological techniques were investigated for their usefulness in the over-all evaluation. Only the basic movements of the upper extremities were considered. Nonetheless, the methods can be applied generally to other body segments, and, therefore, an over-all evaluation of a pressure suit or suit component can be accomplished. (Author)

Sierracin Corp., Burbank, Calif.
MA-3 ELECTRICALLY HEATED FACEPIECE. Rept. on Development of Pressure Suit System, Contract AF 33(616)3746. Jan 60, 26p. Engineering rept. ER-59-269; WADD Technical rept. 60-88; AD-235 995.
Order from LC mi$2.70, ph$4.80 PB 146 662

A proprietary, transparent, electrically conductive coating, "Sierracote III," was successfully incorporated into laminated, formed, optically and thermally satisfactory facepieces. Success in the heating of polyester-vinyl laminates was achieved in a shorter than anticipated period. This permitted the addition of surface coated parts of monolithic acrylic structure to the program. (Author)

PHYSICS

Air Force Missile Development Center, Holloman AFB, N. Mex.
MATHEMATICA MEMORABILIA: LECTURE NOTES ON APPLIED MATHEMATICS; UNDERLYING EQUATIONS OF MAGNETOHYDRODYNAMICS, by Karl Pohlhausen. Lecture notes compiled in the summer of 1959 at Cloudcroft, New Mexico. 1960, 110p. 43 refs. AFMDC-TR-60-8.
Order from LC mi$5.70, ph$16.80 PB 148 205

Contents:
Ordinary linear differential equations with constant coefficients: a classical method; Laplace transformation
Non-linear ordinary differential equations: first-order equations; second-order equations
Variational methods
Hydrodynamics
Heat transfer
Magnetohydrodynamics

Acoustics

Brown U., Providence, R. I.
NONLINEAR SONIC PHENOMENA, by Wesley L. Nyborg. Final rept. on Contract AF 18(603)54. 31 May 60, 63p. 13 refs. AFOSR-TR-60-70; AD-238 441.
Order from LC mi$3.90, ph$10.80 PB 148 558

Theory has been developed for a particular sonic characteristic, acoustic streaming, in terms of the equations of nonlinear acoustics. Detailed experimental investigations have been made of streaming patterns under conditions of interest, and of the effects of streaming on surface processes. Papers included in the report are:
Acoustic streaming near a boundary, AFOSR TN-57-792, pub. in the Jnl. of the Acoustical Society of America 30:329-339, Apr 58
Cavitation microstreaming, pub. in the Jnl. of the Acoustical Society of America 31:54-64, Jan 59
Microscopic eddying near a vibrating ultrasonic tool tip, AFOSR TN-58-991, pub. in Jnl. of Applied Physics 30:949-950, June 59
Sonically-induced microstreaming near a plane boundary. I. The sonic generator and associated acoustic field, AFOSR TN-60-539
Sonically induced microstreaming applied to a surface reaction, AFOSR TN-59-253, pub. in the Jnl. of the Acoustical Society of America 31:706-711, June 59
Effects of acoustic microstreaming at electrodes, AFOSR TN-60-538, pub. in Proceedings of the Third International Congress in Acoustics, Stuttgart, Germany, Sep 59
Imbedded thermistor for boundary layer measurements, AFOSR TN-58-992, pub. in the Jnl. of the Acoustical Society of America 31:249-250, Feb 59.

California U., Los Angeles.
ULTRASONIC ABSORPTION AND DISPERSION IN GASEOUS DIBROMOMETHANE, by Norman J. Meyer. Technical rept. no. 15 on Contract Nonr-233(48). July 59, 74p. 37 refs.
Order from LC mi$4.50, ph$12.30 PB 147 800

Ultrasonic speed of sound and absorption measurements have been made in gaseous dibromomethane at 296°K. and at pressures between 0.5 and 15.0 mm. Hg. A continuous selection of frequencies between 13 and 80 Kcs was used, generated as pulsed sine waves. Independent vibrational relaxation processes were found at 7.0 and 125 Mc/atmos, with corresponding relaxation times of 3.02×10^{-8} and 0.146×10^{-8} secs. A third relaxation process was not within the experimental range of the apparatus. Seven of the nine vibrational modes have sufficient population at 296°K to contribute to the various relaxation processes. Primarily based upon the specific heat contributions of each mode, the assignments of the various modes relaxing at the different relaxation times were made. (Author)

Michigan U. Research Inst., Ann Arbor.
THE CONCEPT OF THE IDEAL OBSERVER IN PSYCHOPHYSICS, by W. P. Tanner, Jr., T. G. Birdsall, and F. R. Clarke. Technical rept. no. 98 on Contract AF 19(604)2277. Apr 60, 45p. 3 refs. 2659-6-T; AFCRC-TR-59-54.
Order from LC mi$3.30, ph$7.80 PB 148 804

This report discusses the manner in which the concept of the ideal observer serves as a tool for the development of a description model of human performance in the detection and recognition of signals. (Author)

Michigan U. Research Inst., Ann Arbor.
DETECTION OF COMPLEX SIGNALS AS A FUNCTION OF SIGNAL BANDWIDTH AND DURATION, by C. D. Creelman. Technical rept. no. 99 on Contracts AF 19(604)2277 and Nonr-1224(22). Jan 60, 20p. 14 refs. 2659-8-T; AFCRC-TR-59-59. Also appears as Rept. no. 6 of Speech Research Lab.
Order from LC mi$2.40, ph$3.30 PB 148 805

An experimental examination of the efficiency of human observers in detecting a stimulus waveform which consists of a train of damped sinusoids is reported. The signal duration and degree of damping (or spectral bandwidth) were varied, with the energy of the signal held constant. Bandwidth is shown to affect human detection more at long than at short durations. (Author)

Naval Research Lab., Washington, D. C.
THEORETICAL ANALYSIS OF MONOSTATIC REFLECTION IN THE FAR FIELD OF RIGID, FINITE OBJECTS, by W. G. Neubauer. Interim rept. 12 July 60, 4 refs. NRL rept. 5467.
Order from LC mi$2.70, ph$4.80 PB 145 244

The solution to the approximate integral form of the reflection in the "far field" has been developed as well as a graphical, or numerical, method for the case of a rigid, finite plane rotated about an edge and for a wedge shape. The reflection may be conveniently presented in diagrams in the complex plane. Extension of the method has been made to the case for the reflection amplitude at any orientation of a reflector. Physically measurable quantities are required in the evaluation of this sum. Although the evaluation is not exact, rapid, or inclusive of all reflection mechanisms, it does make possible the derivation of the reflection from shapes not analytically describable by a means other than the methods which give the reflection in terms of the radii of curvature of the reflecting surface. (Author)

Electricity and Magnetism

Air Force Cambridge Research Center, Bedford, Mass.
THERMOELECTRIC PHENOMENA, by A. D. Johnson. Dec 59, 48p. 7 refs. AFCRC-TR-59-362.
Order from LC mi$3.30, ph$7.80 PB 148 968

This report is intended to serve as an introduction to thermoelectricity. It consists of three parts: the history, advantages, limitations, and applications of thermoelectricity; a physical picture of thermoelectricity, using energy level diagrams; and an accounting of the type and extent of research effort currently devoted to the subject in this country, including references to materials that appear most promising. (Author)

[Army] Signal [Research and Development Lab.] Fort Monmouth, N. J.
MEASUREMENT OF PERMEABILITY AND Q OF MAGNETIC MATERIALS OVER THE FREQUENCY RANGE OF 50 TO 500 MEGACYCLES, by Isidore Bady and Robert Franklin. 30 Sep 55, 70p. 5 refs. Engineering rept. 1159.
Order from LC mi$3.90, ph$10.80 PB 149 418

Four methods for measuring the complex permeability of magnetic materials are given. These are based on the use of a Q meter, cavity resonator, slotted line, and VHF bridge. Test procedures and formulas are given. All formulas are derived. The advantages and disadvantages of the various methods are discussed and sources of errors noted. Tests performed on several samples show very good agreement among the methods. Where discrepancies do occur, the reasons for these discrepancies are discussed. (Author)

Geophysical Inst., U. of Alaska, College.
A NOTE ON HARMONIC ANALYSIS OF GEOPHYSICAL DATA WITH SPECIAL REFERENCE TO THE ANALYSIS OF GEOMAGNETIC STORMS, by Masahisa Sugiura. Scientific rept. no. 1 on Contract AF 19(604)2163. 18 Apr 60, 16p. 6 refs. UAG-R108; AFCRC-TN-60-410; AD-238 213.
Order from LC mi$2.40, ph$3.30 PB 149 757

Some geophysical characteristics tend to have a fixed distribution relative to the sun. An example is the distribution of air temperature on an ideal earth that is perfectly symmetrical (e.g., in its pattern of land and water) about its axis of rotation. In such a case the geophysical characteristic at any fixed station on the earth undergoes a daily variation that depends only on local time (and latitude and season). This simple pattern of daily change may be modified by intrinsic changes in the solar influences on the earth. The harmonic components of the daily variation at any station may in this case undergo phase changes, in some respects corresponding to Doppler shifts of frequency in optical or sonic phenomena. Care is then needed if the results of harmonic analysis are to be properly interpreted. Such interpretation is discussed with reference to the parts Dst and DS of the magnetic storm variations. Like caution must be observed in cases where the amplitude of a harmonic variation changes, with fixed phase. (Author)

Institute of Research, Lehigh U., Bethlehem, Pa.
RESEARCH STUDY ON THE IMPROVEMENT OF MAGNETIC MATERIALS, by H. V. Anderson, Joseph S. Mathias and others. Quarterly progress rept. no. 1, 15 July-15 Oct 53, on Contract DA 36-039-sc-42580. 15 Oct 53, 38p. 6 refs.
Order from LC mi$3.00, ph$6.30 PB 149 599

An extension of the investigation of the influence of time of annealing at 675°C on the response to magnetic annealing is reported. X-ray evidence indicates that the amount of ordered structure present does increase with annealing time in a manner similar to the residual induction. Further investigation of the iron-cerium system, though continuing to provide materials with higher inductions than the base of U. S. S. pure iron, failed to provide improvement over pure iron specimens produced by the same technique. Preliminary work on the iron-beryllium system indicated a distinct increase of residual induction and coercive force with aging in a magnetic field. (Author)

Institute of Research, Lehigh U., Bethlehem, Pa.
RESEARCH STUDY ON THE IMPROVEMENT OF MAGNETIC MATERIALS, by H. V. Anderson, Joseph S. Mathias and others. Quarterly progress rept. no. 2, 15 Oct 53-15 Jan 54, on Contract DA 36-039-sc-42580. 15 Jan 54, 34p. 6 refs.
Order from LC mi$3.00, ph$6.30 PB 149 600

The study of the influence of annealing temperature on response to magnetic annealing of the 50% iron-50% cobalt alloys was extended to include series at 720°C and 740°C. The results indicate that the maximum response obtainable appears to be independent of the annealing temperature, though the annealing time required to achieve the response decreases at the higher temperatures. The coercive force peak obtained on annealing at 675°C becomes almost non-existent at 740°C. The iron-cerium alloy investigations indicate a marked increase in coercive force and little change in induction at 10 to 100 oersteds on increasing the cerium content to 1 and 2%. The variation of B_r/B_s ratio with cerium content appears quite marked. The magnetostriction value of the 1% cerium alloy was fo found to be 1-1.5 microinches per inch $\pm$ 0.5 at 40 oersteds. Attempts to add carbon to the MnSb alloy markedly decreased the saturation. (Author) (See also PB 149 599)

Institute of Research, Lehigh U., Bethlehem, Pa.
RESEARCH STUDY ON THE IMPROVEMENT OF MAGNETIC MATERIALS, by H. V. Anderson, Joseph S. Mathias and others. Quarterly progress rept. no. 3, 15 Jan-15 Apr 54, on Contract DA 36-039-sc-42580. 15 Apr 54, 92p. 55 refs.
Order from LC mi$5.40, ph$15.30 PB 149 601

One phase of the studies of ordering and magnetic annealing of the 50%iron - 50%cobalt alloy has been completed. These studies indicate that for this alloy: (1) The ordering appears to take place by two mechanisms, atomic rearrangement and nucleation and growth; (2) the maximum B_r/B_s ratio, and maximum response to magnetic anneal was obtained for the specimens treated to produce the greatest degree of order; (3) at longer annealing times anneals with the field applied continuously were more effective than anneals with the field on cooling only. A new program has been initiated on the phase of the work directed towards development of soft magnet materials with higher induction at fields of ten and one hundred oersteds. This program involves the determination of the influence of grain size on magnetic properties of alloys of 4% Molybdenum-balance iron. (Author) (See also PB 149 600)

Institute of Research, Lehigh U., Bethlehem, Pa.
RESEARCH STUDY ON THE IMPROVEMENT OF MAGNETIC MATERIALS, by H. V. Anderson, Joseph S. Mathias and others. Quarterly progress rept. no. 4, 14 Apr-15 July 54, on Contract DA 36-039-sc-42580. 15 July 54, 45p. 21 refs.
Order from LC mi$3.30, ph$7.80 PB 149 602

The iron molybdenum alloy investigations indicate a marked dependence of magnetization characteristics on annealing treatment. The best averaged properties obtained to date in the investigations of these alloys are 18,100 and 15,550 gauss at fields of 100 and 10 oersteds respectively. The work done to date on magnetic alloys of non-ferromagnetic materials is summarized. Magnetic data have been reported for Mn-Sb, Mn-Ge and Mn-B binary alloys as well as some ternary alloys with carbon or boron. The calibration method for the magnetostriction measuring equipment has been improved. (Author) (See also PB 149 601)

Institute of Research, Lehigh U., Bethlehem, Pa.
RESEARCH STUDY ON THE IMPROVEMENT OF MAGNETIC MATERIALS, by H. V. Anderson, Marvin C. Y. Lee and others. Quarterly progress rept. no. 5, 15 July-15 Oct 54, on Contract DA 36-039-sc-42580. 15 Oct 54, 27p. 6 refs.
Order from LC mi$2.70, ph$4.80 PB 149 603

Further results on the iron molybdenum investigations are reported. Slightly higher values of B_{100} (18100-18400 gauss) and B_{10} (15620-15850 gauss) were obtained for the 5% molybdenum alloy than thos previously reported for the 4% alloy, though tere was a concurrent increase in coercive force from approximately 0.50 oersteds. Preliminary tests on additional alloys of Manganese indicated ferromagnetism in alloys of Mn-Sn, Mn-C-Sn, Mn-Zn, Mn-Cd, Mn-C-Cd, as well as other complex alloys of the Heusler type. Initial test results are reported for alloys of Mn_xSn_y and $(Mn_4Sn)_xC_y$ types. (Author) (See also PB 149 602)

Institute of Research, Lehigh U., Bethlehem, Pa.
RESEARCH STUDY ON THE IMPROVEMENT OF MAGNETIC MATERIALS, by Marvin C. Y. Lee, Joseph S. Mathias and others. Quarterly progress rept. no. 6, 15 Oct 54-15 Jan 55, on Contract DA 36-039-sc-42580. 15 Jan 55, 59p. 19 refs.
Order from LC mi$3.60, ph$9.30 PB 149 604

Work has been initiated on the iron 6.4% silicon alloy in the hope of determining the relation, if any, between the ordering reaction and the response to annealing in a magnetic field. The first series of rings prepared appear free of defects but show an abnormally low permeability. The studies of the influence of grain size on the magnetic properties of the iron-molybdenum alloy have been completed. The results as reported indicate a decrease of coercive force and an increase of low field permeability with increased grain size. The induction at high fields appears to decrease slightly with increased grain size. Further tests have been made on the Mn-Sn-C system and the Mn-Sb-C system. (Author) (See also PB 149 603)

Institute of Research, Lehigh U., Bethlehem, Pa.
RESEARCH STUDY ON THE IMPROVEMENT OF MAGNETIC MATERIALS, by Marvin C. Y. Lee, Ernest Costello, and others. Quarterly progress rept. no. 7, 15 Jan-15 Apr 55, on Contract DA 36-039-sc-42580. 15 Apr 55, 36p. 8 refs.
Order from LC mi$3.00, ph$6.30 PB 149 605

The critical temperatures for ordering of the Fe-6.1% Si and the Fe-5.2% Si alloys appear to be approximately 645°C and 630°C respectively. By preannealing the iron powders in hydrogen, rings of 5.2 and 6.4% Si – balance iron have been produced with permeabilities in the annealed condition in the range to be expected from such alloys. Further magnetic results are reported for the systems Mn-Sn-C and Mn-Sb-C. Further standard X-ray patterns were run for several of the phases expected to be present in the Mn-Sn-C investigation. The "d" values are presented in this report though metallographic studies and crystal structure analyses have not been performed. (Author) (See also PB 149 604)

Institute of Research, Lehigh U., Bethlehem, Pa.
RESEARCH STUDY ON THE IMPROVEMENT OF MAGNETIC MATERIALS, by Marvin C. Y. Lee, Joseph S. Mathias and others. Final rept. for 16 July 53-15 July 55 on Contract DA 36-039-sc-42580. 15 July 55, 40p. 26 refs.
Order from LC mi$3.00, ph$6.30 PB 149 606

The studies of the influence of time and temperature on the response of the 50% iron - 50% cobalt alloys to heat treatment in a magnetic field have been completed as have the studies of the influence of grain size on the magnetization curve and coercive force of iron-molybdenum. The results of these investigations are summarized. Magnetic data have been obtained on a number of alloys of manganese including alloys in the binary systems Mn-Ge, Mn-Sb, Mn-B, and Mn-Sn and the ternary system Mn-C-Sn. Some data have also been reported on preliminary studies of the Mn-Sb-C and Mn-Sb-B systems. Preliminary studies have been made of other alloys of manganese and of chromium as well as of the iron-beryllium system. Work has progressed on the construction of equipment for measuring high temperature magnetostriction and magnetocrystalline anisotropy. (Author) (See also PB 149 605)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A SOLUTION FOR THE MAGNETIC FIELD IN FERROMAGNETIC LAMINATIONS WITH NON-LINEAR B-H CHARACTERISTICS, by K. T. Lian. Rept. on Contract Nonr-839(05). 22 Sep 59, 33p. 7 refs. Research rept. R-766-59; PIB-694; AD-229 995.
Order from LC mi$2.40, ph$3.30 PB 148 897

A technique is described for determining the field distribution inside a ferromagnetic lamination or slab when the material is excited by a step of magnetic field (H) applied to the surface. The functional form of the solution is found to be independent of the shape of the B-H characteristic. (Author)

Scripps Institution of Oceanography, U. of California, La Jolla.
GEOMAGNETIC WESTWARD DRIFT AND IRREGULARITIES IN THE EARTH'S ROTATION, by Michael G. Rochester (U. of Utah). Final rept. on Contract Nonr-2216(03). 15 July 59, 58p. 19 refs. AD-220. 218.
Order from LC mi$3.60, ph$9.30 PB 148 186

Bullard's (1950) rigid-sphere model for the steady westward drift of the Earth's non-dipole magnetic field is extended to include the magnetic coupling provided by the presence of the higher multipole fields at the core-mantle boundary. If the first 6 harmonics of the observed surface field are taken into account, the retarding couple on the mantle is increased by a factor of 1.6. Using this result it would follow from Bullard's specialized model of the core that the geomagnetic dynamo mechanism generates a toroidal field of several hundred gauss in the deep interior of the core. Time-dependent perturbations of the mantle-core coupling are investigated, and it is shown that reasonable fluctuations of the fields at the core-mantle boundary are capable of explaining changes in the length of day at the rate of order 1 msec in 10 yr. The argument provides additional evidence that the mean electrical conductivity in the bottom 2000 km of the mantle is at least 10^{-9} emu. A summary of knowledge of the distribution of electrical conductivity with depth in the Earth is given. (Author)

Electronics

Air Force Cambridge Research Center, Bedford, Mass.
A YEAR'S SAMPLING OF HIGH-FREQUENCY ARCTIC SIGNALS, by H. S. Marsh. Apr 60, 49p. 13 refs. AFCRC-TR-60-125.
Order from LC mi$3.30, ph$7.80 PB 148 967

This report covers a year's intermittent sampling at Scituate, Mass., on various High-frequency Arctic signals, predominantly the Thule 12- and 18-Mcps slant-sounder signals, with particular interest in Arctic blackout occurrences. The limited sampling possible, plus the abnormality of "normal" Arctic ionospheric conditions reduced the information gained on blackout morphology. Several definite trends that emerged are presented. Other ionospheric anomalies observed, including normal relative-frequency diurnal and seasonal variations, contrasted with their expansions during magnetic disturbances and approaching blackout conditions; brief thermal dropouts of interfering signals around sunrise and sunset and validity of Appleton-Beynon 'curved layer, thin earth' geometry when the signal is close to the MUF, are examined in some detail. (Author)

Antenna Lab., Ohio State U. Research Foundation, Columbus.
THE EVALUATION OF INCOMPLETE NORMALIZATION INTEGRALS AND DERIVATIVES WITH RESPECT TO THE ORDER OF ASSOCIATED LEGENDRE POLYNOMIALS, by Raphael Tsu. Rept. on Monostatic and Bistatic Measurement of Scattering Shapes and Synthesis of Scattering Shapes, Contract AF 19(604)6157. 1 Apr 60, 23p. 7 refs. Rept. 1073-3; AFCRC-TN-60-376.
Order from LC mi$2.70, ph$4.80 PB 148 789

Material pertinent to scattering pattern synthesis is presented. The evaluation of the incomplete normalization integrals and derivatives with respect to the order of associated Legendre Polynomials are presented. These integrals arise from the study of a scatterer which has a minimum average scattering cross section in a given cone. The formulas of $(\partial P_\nu / \partial \nu)_{\nu = n}$ for n = 0, 1, 2 are obtained in closed form. Various recurrence relations are derived.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE VELOCITY DISTRIBUTION IN A MOLECULAR BEAM, by F. O. Vonbun. 15 Mar 60, 13p. 7 refs. USASRDL Technical rept. 2103; AD-236 952.
Order from LC mi$2.40, ph$3.30 PB 149 385

The velocity distribution in a mean of molecules after it has been subjected to an inhomogeneous, cylindrical electric or magnetic field is calculated. The molecules under consideration are under the influence of a force directed toward the axis of the focusing or separating system. The resulting velocity distribution is a simple analytical function in which, p, N, q and x are practical parameters of the focusing system and the molecule itself. Expressions are derived for the average and most probable velocities in a beam leaving the focuser, as well as for the increase in total flux from the end of the focuser due to the applied field. A simple formula is given for the effectiveness of separation of molecules in various quantum states. (Author)

Case Inst. of Tech., Cleveland, Ohio.
SCATTERING OF A PLANE WAVE ON A FERRITE CYLINDER AT NORMAL INCIDENCE, by W. H. Eggimann. Scientific rept. no. 11 on Contract AF 19(604)3887. 25 Feb 60, 26p. 3 refs. AFCRC-TN-60-380. AD-237 887.
Order from LC mi$2.70, ph$4.80 PB 148 194

The diffraction of a plane wave on a circular ferrite cylinder at normal incidence is investigated. The scattered field is found as a series of cylinder functions. The amplitude and phase of the scattered field have been calculated on a digital computer for various values of cylinder radius and permeability of the ferrite. Approximation formulas for the thin cylinder and the far field have been developed. It is found that the field is asymmetrical with respect to the scattered direction of the incident field. For certain values of the parameters, the scattered field has the form of a spiral wave, due to the precession of the magnetic dipole currents. Application of ferrite rods in scanning antenna systems seem feasible. (Author)

Defense Research Lab., U. of Texas, Austin.
DIELECTRIC WAVEGUIDES AND RADIATORS, by Chester M. McKinney, Jr. Doctoral thesis. Rept. on Contract NOrd-9195. Sep 50, 278p. 79 refs. Bumblebee Series rept. no. 138.
Order from LC mi$11.10, ep$45.60 PB 149 616

This report released for sale to the public 13 Sep 60.

Contents:
Mode exciters and transducers for electromagnetic waves
Dielectric waveguides of circular cross section
Dielectric radiators

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
POLARIZATION ANALYSIS AND SYNTHESIS, by Harold L. Newman. Rept. on Contract DA 36-039-sc-75012. 10 Mar 59, 29p. 7 refs. Technical memo. no. EDL-M183; AD-213 825.
Order from LC mi$2.70, ph$4.80 PB 147 441

Problems involved in matching the polarization of a transmitter to that of a particular incoming signal are examined. This includes consideration of the parameters required for the specification of polarization, the effect on power transfer between antennas of errors in matching polarization, various means whereby polarization parameters may be measured and synthesized, and determination of the requirements of the major components of a system which will automatically accomplish polarization detection, analysis, and synthesis. (Author)

Hughes Research Labs., Malibu, Calif.
TIME DOMAIN SIDELOBE SUPPRESSION, by H. H. Hougardy. Quarterly rept. no. 3, 1 Oct-31 31 Dec 59, on Contract AF 30(602)2021. [1960] 41p. 4 refs. RADC-TN-60-76; AD-237 680.
Order from LC mi$3.30, ph$7.80 PB 148 087

Analytic studies have been continued in the areas of optimum modulation forms, systems compatibility, and error analysis. A method of synthesizing the modulation for a linear array in terms of a desired sidelobe level is established, and the time domain linear array theory is extended to modulated two-dimensional apertures. Performance of time modulated antennas with regard to gain, tracking sensitivity and utility in Doppler systems is considered. Results of initial efforts on an error analysis of a modulated cosine-on-a-pedestal distribution are presented. In addition, the experimental effort in developing a receiver detection system is discussed. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A THEORY OF BUNCHING PHENOMENA IN MAGNETICALLY CONFINED BEAMS FOR FAST-WAVE MICROWAVE TUBES, by Michio Nakano. Rept. on Contract AF 19(604)4143. 1 Oct 59, 70p. Research rept. R-772-59; PIB-700; AFCRC TN-60-109; AD-234 016.
Order from LC mi$3.90, ph$10.80 PB 146 328

The possibility of high power generation from the initial gyration energy in magnetically confined electron beam through the fast-wave interaction at the cyclotron resonance is studied. It is shown that this bunching is possible in a gyrating beam interacting with an RF magnetic field. Microwave generation in plasma media is considered, because phenomena in a fully ionized plasma have much in common with those in a high density electron beam. The study of the mechanism of bunching pheomena in magnetically confined media suggests many interesting applications such as new types of amplifiers, oscillators and other relative devices. (Author)

Naval Civil Engineering Lab., Port Hueneme, Calif.
INTERFERENCE SUPPRESSION FOR AUTOMOTIVE IGNITION SYSTEMS, by A. Mason Brown. Final rept. 18 Feb 60, 23p. 3 refs. Technical rept. 070; AD-234 876.
Order from LC mi$2.70, ph$4.80 PB 147 812

A low-cost radio interference suppression harness for automotive ignition systems is being developed and is based on the following premises: (1) the mild steel sheet-metal stampings could be substituted for bronze castings as suppression shields; and (2) that standardized parts might be designed to fit all engines. Fabrication of the shielding components from sheet metal successfully resulted in providing satisfactory suppression characteristics. Standardization of parts to include 3 different types of engines was partially successful.

Molecular Physics and Spectroscopy

Arkansas U., Fayetteville.
ATOMIC SPECTROSCOPIC INVESTIGATION OF NUCLEAR PROPERTIES, by R. H. Hughes. Technical rept. on Contract AF 18(603)26. Feb 60, 21p. 17 refs. AFOSR-TR-60-28; AD-233 294.
Order from LC mi$2.70, ph$4.80 PB 146 753

A study of the isotope shifts in the atomic spectra of the medium-weight elements was undertaken. Experimental data were obtained on the isotope shifts in the spectra of strontium, molybdenum, and ruthenium. An apparent correlation was discovered between the binding energy of the last pair of neutrons, obtained from mass spectroscopic data, and isotope shifts. (Author)

Colorado U., Boulder.
HIGH PRECISION MICROWAVE SPECTROMETER FOR 60 kMc, by Robert W. Zimmerer. Doctoral thesis. Technical rept. no. 3 on Contract Nonr-1147(05). Aug 59, 17p. 5 refs. AD-226 157.
Order from LC mi$2.40, ph$3.30 PB 148 873

A high precision microwave spectrometer incorporating several novel ideas was developed to measure the fine structure of the rotational levels of oxygen. The transitions lie between 50 and 65 kmc. The spectrometer is quite dependable. It was used for many hr of continuous operation with no adjustment. Three 60,000,000 kc oxygen lines were measured to 5 kc. The measurements are made by tuning first to one side of the absorption peak and then the other while counting the frequency against the 100 kc national standard. To record the line shape the 15 mc oscillator is tuned through the absorption line by a motor drive. The Zeeman components can be recorded by increasing the bias current in the Zeeman coil until they are resolved in the quiescent field. A normal line recording superposed on a recording of the Zeeman components is shown. The Zeeman components compare nicely with the theoretical expectation. Any contribution by the π lines was very small.

Gates and Crellin Labs. of Chemistry, Calif. Inst. of Tech., Pasadena.
THE ACTIVATION ENERGY OF INVERSION IN SUBSTITUTED 1-METHYLAZIRIDINES (N-METHYLETHYLENIMINES) MEASURED BY THE NUCLEAR MAGNETIC RESONANCE TECHNIQUE, by A. Lowenstein and John D. Roberts. Technical rept. no. 6 on Contract Nonr-220(26). 1 Sep 59, 15p. 13 refs.
AD-225 557.
Order from LC mi$2.40, ph$3.30 PB 148 862

The activation energy ΔE, and frequency factor ν_o, for inversion in 1-methyl-2, 2-dimethylaziridine (I) and 1-methyl-2-methyleneaziridine (II) have been measured using the n-m-r- technique. The results are $\Delta E = 10.0$ Kcal. and $\nu_o = 5 \times 10^7$ sec. $^{-1}$ for I and $\Delta E = 6.4$ Kcal. and $\nu_o = 1 \times 10^9$ sec. $^{-1}$ for II. ΔE and ν_o have also been measured for solutions of I in methanol and carbon tetrachloride. The results are: $\Delta E = 6.8$ Kcal.; $\nu_o = 2 \times 10^5$ sec. $^{-1}$ and $\Delta E = 7.8$ Kcal.: $\nu_o = 1 \times 10^6$ sec. $^{-1}$, respectively. (Author)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
DRIFT TUBE-MASS SPECTROMETER FOR STUDIES OF THERMAL-ENERGY ION-MOLECULE REACTIONS, by E. W. McDaniel and D. W. Martin. Technical rept. no. 3 on Contract AF 18(600)1524.
20 June 60, 34p. 21 refs. AFOSR-TN-60-661;
AD-239 337.
Order from LC mi$3.00, ph$6.30 PB 148 965

Apparatus has been developed for the mass spectrographic study of ion-molecule reactions occurring under gas-kinetic conditions at thermal energies. Ions are produced inside a two-foot-long drift space containing gas at a pressure of up to 0.7 mm Hg. A thermionic source utilizing a thoriated iridium filament is used for this purpose. The ions diffuse down the drift tube under the action of a weak electric field and pass through a small aperture at the end into a field-free, two-stage differential pumping chamber. From the second stage of this chamber the ions enter a 60° magnetic deflection mass spectrometer. The number of ion-molecule collisions in the drift tube may be varied over a wide range by changing the source position and the gas pressure, and information concerning the nature and probability of various reactions is revealed by the resulting changes in mass spectra. The apparatus may also be used for surface reaction studies, ionic mobility measurements, and for crude investigations of the lifetimes of unstable ions against spontaneous disintegration. (Author)

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
EQUILIBRIUM EMISSIVITY CALCULATIONS FOR A HYDROGEN PLASMA AT TEMPERATURES UP TO 10,000°K, by D. Olfe. Technical rept. no. 14 on Contracts AF 18(603)2 and Nonr-220(03). May 60, 69p. 53 refs. AFOSR-TN-60-669; AD-239 405.
Order from LC mi$3.90, ph$10.80 PB 149 142

The important equilibrium emission processes in a hydrogen plasma have been investigated in the temperature range between 300°K and 10,000°K for pressures up to several hundred atmospheres. Representative emissivity calculations have been carried out for a transparent gas at a total pressure of 100 atmos and a mean beam length of 30 cm. Important emissivity contributions were made by the pressure-induced fundamental vibration-rotation band and rotational lines of H_2 at the lower temperatures, i.e., below approximately 4500°K. Above this temperature, the bound-free and free-free transitions of the H^- ion and the continuum and line radiation of the H atom are the most important contributors to the emissivity. The following emission processes were also investigated: the bound-free transitions of the H_2^+ ion, free-free transitions of colliding H atoms and H^+ ions, electronic transitions of the H_2 molecule, quadrupole vibration-rotation transitions of the H_2 molecule, and vibration-rotation transitions of the HD molecule. In addition, the effects of the lowering of the ionization potentials by the fields of plasma ions and of the very broad wings of the Lyman α line have been considered. (Author)

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
SHOCK-TUBE MEASUREMENTS OF THE f-NUMBER FOR THE (0,0)-BAND OF THE OH $^2\Sigma \longrightarrow {}^2\Pi$ TRANSITIONS, by M. Lapp. Technical note no. 11 on Contract AF 18(603)2. May 60, 45p. 17 refs. AFOSR-TN-60-666; AD-239 582.
Order from LC mi$3.30, ph$7.80 PB 149 139

The f-number for the (0,0)-band of the $^2\Sigma \longrightarrow {}^2\Pi$ transitions of OH has been found to be $(0.9 \pm 0.5) \times 10^{-3}$. A shock tube was used to produce hot gas samples at temperatures from 3300 to 3900°K with equilibrium partial pressures of OH of 0.004 to 0.02 atm. The emission intensities were measured photoelectrically as a function of time behind the reflected shock in a selected spectral interval. These results were then related to the f-number by means of an absolute intensity calibration. (Author)

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
SHOCK-TUBE MEASUREMENTS OF THE HOMOGENEOUS RATE OF DECOMPOSITION OF NH_3 IN NH_3-Ar MIXTURES, by T. A. Jacobs. Technical note no. 12 on Contract AF 16(603)2. May 60, 12p. 14 refs. AFOSR-TN-60-667; AD-239 584.
Order from LC mi$2.40, ph$3.30 PB 149 140

The advent of the shock tube and "fast" infrared detectors have now made possible a method for the measurement of the homogeneous decomposition rate. This paper reports the results of preliminary activation energy measurements for the homogeneous decomposition of NH_3. (Author)

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
VIBRATIONAL RELAXATION IN CYLINDRICAL CHAMBERS CONTAINING ISOTHERMAL, DILUTE GAS MIXTURES, by S. S. Penner, D. Olfe, and T. A. Jacobs. Technical note no. 13 on Contract AF 18(603)2. May 60, 14p. 9 refs. AFOSR-TN-60-668; AD-239 585.
Order from LC mi$2.40, ph$3.30 PB 149 141

The problem is considered of vibrational excitation in the presence of an external radiation field and deexcitation in the absence of the field for stationary, dilute systems in cylindrical containers in which surface deactivation of excited species is so effective as to reduce the concentration of vibrationally excited molecules to zero at the bounding surfaces. The rate of excitation in an external radiation field is examined and the subsequent rate of deexcitation when the external radiation field is removed.

Laboratory of Astrophysics and Physical Meteorology, Johns Hopkins U., Baltimore, Md.
INTERFEROMETRIC DETERMINATION OF FAR INFRARED LINE WIDTHS, by Ernest V. Loewenstein. Progress rept. on Contract AF 18(600)1307. 1 Jan 60, 122p. 22 refs. AFOSR-TN-60-65.
Order from LC mi$6.30, ph$19.80 PB 149 162

A study has been made of pressure broadening of two pure rotational lines: the line of ammonia at 20 cm^{-1} and that of hydrogen chloride at 40 cm^{-1}. The data have been analyzed by the Ladenburg-Reiche method to obtain the widths of the lines. The experimental uncertainties present in the data made it necessary to use the calculated line strengths in order to arrive at values of the widths. In addition, the transmission spectra of several discs of sapphire have been measured. The channel spectrum arising in the sapphire has been analyzed for index of refraction and extinction coefficient. The channel spectrum shows clearly that sapphire is birefringent. The transmission of sapphire in the far infrared has also been determined.

Massachusetts Inst. of Tech., Cambridge.
INFRARED SPECTRA OF ADSORBED MOLECULES, by Carl W. Garland. Final rept. for 1 Nov 55-30 June 69 on Contract Nonr-1841(01). 30 Oct 59, 18p. 3 refs. AD-228 622.
Order from LC mi$2.40, ph$3.30 PB 149 515

An analysis is given of work on CO chemisorbed on rhodium and on the effect of poisoning with CS_2 on the spectrum of CO adsorbed on nickel. New work on the desorption of CO from nickel samples of varying composition and the reaction of CO with nickel surfaces to form $Ni(CO)_4$ is reported. Brief mention is made of some results for CO on cobalt samples. (Author)

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP. Quarterly progress rept. no. 34 on Contract Nonr-1841(34). 15 Oct 59, 90p. 77 refs. AD-227 806.
Order from LC mi$4.80, ph$13.80 PB 149 517

Contents:
Energy bands in iron
Note on the structure of the 3d bands in iron group crystals
Atomic scattering factors for the iron transition series
Restricted and unrestricted Hartree-Fock calculations for atomic lithium
On the role of the equivalence restriction in molecular claculations
Interaction of a hole with mobile lattice ions in KCl
An inductive method for generating the irreducible representations of the group of spin coordinate permutations
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Computer techniques
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(See also PB 146 031)

Ohio State U. Research Foundation, Columbus.
OPTICAL CONSTANTS OF SOME IONIC CRYSTALS IN THE REGION OF THEIR FAR INFRARED EIGENFREQUENCIES, by Ely E. Bell and Raymond L. Brown. Scientific rept. no. 2 on Contract AF 19(604)4119. 17 Nov 59, 72p. 35 refs. AFCRC-TN-60-260; AD-233 492.
Order from LC mi$4.50, ph$12.30 PB 147 807

The percent transmission of LiF, LiCl, NaBr, KCl, KBr, and KI was measured in the far infrared region of strong absorption neighboring the eigenwavelength. This was done for 3 samples of each material. The samples were prepared by evaporating, in a high vacuum, thin films (0.1 to 1μ thick) of material onto collodion substrates. The transmission measurements were made for sample temperatures of about 300°K and about 100°K. From the transmission measurements the values of the eigenwavelength for each material were determined to within +0.1μ at both temperatures. The classical dispersion formula was assumed to describe correctly the wavelength dependence of n and k in the region of strong absorption. Values for the constants of the dispersion formula were determined which gave good agreement between the measured transmission and the transmission calculated using an approximate transmission formula. These constants were used in the dispersion formula in the calculation of values of n and k for several wavelengths within the region of strong absorption. This was done for each material at both temperatures. Where similar data existed a comparison was made with the results obtained in the present work. In all cases the agreement was within the experimental accuracy of the investigation. (Author)

Padova U. (Italy).
ON THE ELECTRONIC AND MICROWAVE SPECTRUM OF FORMYL FLUORIDE, by G. Semerano. Final technical rept., for 1 Feb 59-31 Jan 60, on Contract DA 91-591-EUC-1050. [1960] 26p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 149 450

Contents:
Semiempirical calculations of the low energy levels of HFCO with emphasis on the comparison with analogous calculations for the formaldehyde levels
Vibrational analysis of the $n \rightarrow \pi$ transition
Rotational analysis by microwave spectroscopy
(See also PB 143 052)

Purdue Research Foundation, Lafayette, Ind.
THE ARC SPECTRUM OF CESIUM, by H. Kleiman and K. W. Meissner. Technical rept. no. 1 on Spectroscopic Research, Contract Nonr-1100(08). Oct 59, 39p. 31 refs. AD-228 375.
Order from LC mi$3.00, ph$6.30 PB 149 501

Precision measurements were made on 63 lines in the arc spectrum of Cs. The first 3 members of the principal series were measured interferometrically for the first time, allowing improvement in the level scheme. Comparison was made of the wavelengths emitted by 2 different light sources, a Geissler tube and an electrodeless discharge lamp, and a relative shift was found in the high members of the fundamental series. The term values found were fitted to extended Ritz type formulas with fair accuracy. The polarization formula was used to fit the fundamental series. (Author)

Stanford Research Inst., Menlo Park, Calif.
MASS SPECTROMETRIC STUDY OF THE HEATS OF DIMERIZATION OF THE ALKALI CHLORIDES, by Thomas A. Milne and H. Michael Klein. Technical note no. 6 on Contract AF 49(638)89. June 60, 29p. 46 refs. AFOSR-TN-60-512. AD-239 918.
Order from LC mi$2.70, ph$4.80 PB 149 159

The heats of sublimation of the important species in equilibrium with the five alkali chlorides have been determined using the Bendix time-of-flight mass spectrometer. The mass spectrometrically determined differences between the heats of sublimation of monomer and dimer have been combined with the best available value for the monomer heat of sublimation to calculate the dimerization energies for all five salts. For LiCl a trimerization energy was also determined. These results are compared with the results of previous studies. (Author)

Virginia U., Charlottesville.
ENERGY SPECTRUM OF THE PHOTONEUTRONS FROM GOLD, by R. F. Askew and A. P. Batson. Technical note on Contract AF 49(638)176. July 60, 19p. 7 refs. AFOSR-TN-60-790.
Order from LC mi$2.40, ph$3.30 PB 149 223

The energy spectrum of the neutrons produced at 90° to a gold target bombarded with 55 Mev bremstrahlung has been measured. Nuclear emulsions were used to detect the photoneutrons. The spectrum shows two peaks. The large peak at 1.25 Mev can be interpreted as due to the statistical decay of the compound nucleus. The smaller peak at about 5.5 Mev is assumed to come from a "direct" transition, as described by the Wilkinson model. In the appendix a new method is presented for the calculation of the corrections involved for those proton recoils which leave the emulsion. (Author)

Willow Run Labs., U. of Michigan, Ann Arbor.
ELECTRIC-FIELD-INDUCED INFRARED SPECTRUM by R. W. Terhune. Rept. on Project Michigan, Contract DA 36-039-sc-78801. May 59, 15p. 14 refs. Rept. no. 2900-1-T.
Order from LC mi$2.40, ph$3.30 PB 147 275

A supplemental technique for molecular spectroscopy has been developed to measure very small percentage absorptions in the infrared at comparatively high resolution. Changes in transmission of 1 part in 10,000 with a resolution of 1 cm^{-1} at 4000 cm^{-1} were readily measured by modulating the absorption. Electric-field-induced absorption was observed for some 8 vibration-rotation transitions of H_2 and 7 of D_2. Also, the Stark effect on an infrared active vibration of NH_3 was observed. (Author)

Optics

Institute of Mathematical Sciences, New York U., N. Y.
A STUDY OF THE FAR INFRARED PROPERTIES OF CRYSTALS, by J. H. Rohrbaugh. Scientific rept. no. 10, 1 Dec 59-29 Feb 60, on Contract AF 19(604)2673, continuation of Contracts W28-099-ac-171, AF 19(122)4, and AF 19(604)1115. [1960] 13p. 3 refs. AFCRC-TN-60-561.
Order from LC mi$2.40, ph$3.30 PB 149 172

A comparison and evaluation is made of the low temperature specific heat and resultant Debye temperature variations for NaCl as calculated here by Arase as compared to the work of Lundquist and of Karo. Further testing and improvement of the spectrometer is also reported. (Author) (See also PB 145 651)

Naval Ordnance Test Station, China Lake, Calif.
DESIGN OF FOUR GENERAL-PURPOSE INFRARED LENSES, by J. R. Snyder. 18 Nov 59, 22p. 2 refs. NOTS TP-2430; NAVORD rept. 7041; AD-235 313.
Order from LC mi$2.40, ph$3.30 PB 147 810

Four infrared lenses have been designed for general purpose use in the wavelength region of 2.0 to 11.0μ. No aspheric surfaces or mirrors are employed. Focal-length to aperture ratios range from 5.0 to 1.13, focal lengths from 2.0 to 24.0 in. and fields covered from 2.0 to 40.0°. The image of a point source varies from 0.6 to 4 milliradians. (Author)

Razdow Labs., Inc., Newark, N. J.
DETERMINATION OF DESIGN DATA FOR THE TRACKER EVALUATING SYSTEM, by A. Razdow. Quarterly rept. no. 1, 12 Jan-15 Apr 59, on Optical Tracker Evaluation and Accuracy Test System, Contract DA 36-039-sc-78271. [1959] 66p.
Order from LC mi$3.90, ph$10.80 PB 148 337

The subject of this report is the analysis of the basic problems connected with the evaluation of optical target locator systems and the search for simple solutions to these problems. It deals specifically with the compilation of data for the exact calculation of the various dimensions and angles. A detailed analysis is made of the minimum requirements for the dimensional and angular tolerances design data for the determination of baselines and the definition of errors in the test system and system under test. (Author)

Razdow Labs., Inc., Newark, N. J.
DETERMINATION OF DESIGN DATA FOR THE TRACKER EVALUATING SYSTEM, by A. Razdow. Quarterly rept. no. 2, 16 Apr-17 July 59, on Optical Tracker Evaluation and Accuracy Test System, Contract DA 36-039-sc-78271. [1959] 86p.
Order from LC mi$4.80, ph$13.80 PB 148 338

The subject of this report is the analysis of the problem of dynamic evaluation of optical trackers, the analysis of pertinent problems of geodetic measurements, the application of astronomical techniques, the analysis of energy transmission of a light link, the investigation of external error producing factors, and a preliminary design plan for the evaluation system. One version of the evaluation system was breadboarded and tested on an Askania Cine-Theodolite. Formulae are derived for the location of a concealed axis of rotation with respect to an external point and also for the transformation of externally measured angles to the coordinate system of the optical tracker. The problem of the dynamic evaluation of infrared tracking systems is investigated and a solution proposed. (Author) (See also PB 148 337)

Razdow Labs., Newark, N. J.
DETERMINATION OF DESIGN DATA FOR THE TRACKER EVALUATION SYSTEM, by A. Razdow and Elliott F. Cameron. Quarterly rept. no. 3, 18 July-19 Oct 1959, on Optical Tracker Evaluation and Accuracy Test System, Contract DA 36-039-sc 78271. [1959] 33p.
Order from LC mi$3.00, ph$6.30 PB 148 339

The scope of this report includes the design parameters of the search beam, the definition of reference lines and checking of scale accuracy by astronomical means, and a design which includes the sensing of the angular velocity of the tracker and the synchronization of the target flashes with the mid exposure position of the camera shutter. This preliminary design is adaptable to servo driven and manually operated tracking instruments which may be equipped with either single frame cameras or intermittent motion picture cameras. The theory involved in the determination of the time of transit of a particular star at a given meridian is explained and illustrated with a detailed example. The application of this theory to the static and dynamic testing of an optical tracker is further developed. (Author) (See also PB 148 338)

Scripps Institution of Oceanography, U. of California, La Jolla.
ON THE STRUCTURE OF THE LIGHT FIELD AT SHALLOW DEPTHS IN DEEP HOMOGENEOUS HYDROSOLS, by Rudolph W. Preisendorfer. Rept. no. 3-5 on Contract NObs-72039. Mar 59, 50p. 6 refs. AD-216 039.
Order from LC mi$3.30, ph$7.80 PB 148 375

Recent experimental determinations of the up and downwelling irradiances in Lake Pend Oreille are studied with the purpose of explaining certain observed nonlinear trends in the semilog plots of these irradiances at shallow depths. A mathematical model which describes these irradiances is derived from the basic equations of radiative transfer. The model explains the observed phenomena in terms of the inherent optical properties of the medium and its external lighting conditions. On the basis of the cited experimental evidence and supporting theory hypotheses about light fields in all homogeneous natural hydrosols are proposed.

Visibility Lab., U. of California, San Diego.
THE CONTRAST TRANSMITTANCE DISTRIBUTION AS A POSSIBLE TOOL IN VISIBILITY CALCULATIONS, by Rudolph W. Preisendorfer and James L. Harris. Rept. on Contract NObs-72092. 1 Oct 58, 15p. 2 refs. SIO Ref. 58-68; AD-212 697.
Order from LC mi$2.40, ph$3 30 PB 148 377

The purpose of this note is to introduce the concept of the contrast transmittance distribution and to point out its potentially useful application to the general visibility problems in natural aerosols and hydrosols. It is shown that the contrast transmittance distribution: (a) can quite generally be assigned the status of an (apparent) optical property of scattering-absorbing media. (b) possesses certain useful analytical properties which are precisely analogous to those of the well-known beam transmittance function T_1. (c) can eliminate the need for the explicit determination of the volume attenuation function a insofar as a is required in the customary solution procedures of apparent contrast problems.

Visibility Lab., U. of California, San Diego.
A STUDY OF LIGHT-STORAGE PHENOMENA IN SCATTERING MEDIA, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Mar 59, 43p. 2 refs. SIO Reference 59-12; AD-213 774.
Order from LC mi$3.30, ep$9.30 PB 150 154

This report released for sale to the public 13 Sep 60.

Solid State Physics

Air Force Cambridge Research Center, Bedford, Mass.
THIN FILM EVAPORATION TECHNIQUES, by I. Berman. Mar 60, 13p. 8 refs. AFCRC-TN-60-382.
Order from LC mi$2.40, ph$3.30 PB 148 969

P-N junctions were made by evaporating aluminum upon N-type silicon held at fixed temperature. These junctions were measured by metallograph techniques. A description is given of the evaporating techniques and a discussion of the system is presented. (Author)

Armour Research Foundation, Chicago, Ill.
EXCESS NOISE IN SEMICONDUCTORS, by James J. Brophy. Rept. for 15 Nov 58-14 Nov 59 on Contract NOnr-1800(00). 22 Oct 59, 82p. 6 refs. ARF 1066, Summary rept. no. 4; AD-228 634.
Order from LC mi$4.80, ph$13.80 PB 149 505

Random electrical noise phenomena in solids was studied to understand the origin of 1/f noise in ZnO and to apply noise measurements to the problem of trapping transitions and neutral energy transport in

cadmium sulfide. A characteristic relaxation time of 500 μsec associated with exciton diffusion or other neutral transport in CdS was established from noise measurements. Under uniform illumination the current noise in single crystal CdS may be interpreted in terms of multiple trapping in shallow levels within 0.5 volts of the conduction band. Discrete levels at 0.36 and 0.43 volts were observed in lightly doped crystals. Noise measurements are particularly suitable for determination of frequency factors of such traps and values ranging from 10^8 to 10^{11} sec^{-1} are derived. It is possible to account semi-quantitatively for the 1/f noise present in some crystals on the basis of the exponential trap distribution determined from photoconductivity experiments and the constant frequency factor of these traps derived from low frequency noise measurements. (Author) (See also PB 144 274)

[Army] Signal [Research and Development Lab.] Fort Monmouth, N. J.
MEASUREMENT OF THE COMPLEX DIELECTRIC CONSTANT OF VERY HIGH DIELECTRIC CONSTANT MATERIALS AT MICROWAVE FREQUENCIES, by Isidore Bady. 22 Apr 54, 52p. Technical memo. no. M-1569.
Order from LC mi$2.60, ph$9.30 PB 149 419

Two methods for the measurement of the complex dielectric constant of very high dielectric constant materials at microwave frequencies are given. The first method is suitable for low loss or moderately lossy samples, and the second method is suitable for very lossy samples. In the first method, the sample is placed in a wave guide with a signal generator and slotted section (or pair of directional couplers) on one side, and a movable short on the other side. Measurement of the maximum and minimum VSWR's obtained when the position of the short is varied, gives sufficient information to calculate the complex dielectric constant of the sample. In the second method, the sample is placed in a wave guide with a signal generator and slotted section on one side, and a slotted section and movable short on the other side. Measurement of the ratio of the field intensities in the two slotted section as the short is adjusted to give resonance in the second slotted section, and measurement of VSWR in the first slotted section, give sufficient information to calculate the complex dielectric constant of the material. The sensitivity of the measurement can be increased by tuning out all or part of the mismatch on the generator side of the sample. (Author)

Case Inst. of Tech., Cleveland, Ohio.
THE PRESSURE VARIATION OF THE ELASTIC CONSTANTS OF SODIUM, by W. B. Daniels. Technical rept. no. 3 on Contract Nonr-1141(05). June 58, 25p. 22 refs.
Order from LC mi$2.70, ph$4.80 PB 147 262

The pressure variation of the single crystal elastic constants of sodium at room temperature using a modified ultrasonic pulse echo method are: $dC_{44}/dP = 1.63$, $dC'/dP = 0.226$, $dB_S/dP = 3.60$.

Detroit U., Mich.
THE STUDY OF PROPERTIES OF SINGLE CdS AND ZnS CRYSTALS FOR USE AS DETECTORS IN CRYSTAL COUNTERS, by S. J. Czyzak, H. Payne and others. Technical rept. no. 5, 1 Sep 58-31 Aug 59 on Contract Nonr-1511(01). 1 Oct 59, 37p. 27 refs. AD-227 777.
Order from LC mi$3.00, ph$6.30 PB 149 503

Progress is reported on the growing of single CdS and ZnS crystals. A new technique in powder preparation has produced single crystals of greater purity. By heat treating the grown crystals hexagonal ZnS crystals were produced more easily than the cubic ZnS crystals, the reaction in the latter being sluggish. More accurate data was obtained by employing new techniques and more sensitive apparatus in the measurement of the electrical properties of CdS and ZnS. Rechecking of data shows the results to be consistent. Electron polarizabilities of free positive ions were calculated. The work on dislocation studies of Zns single crystals is being continued. (See also PB 143 223)

Gordon McKay Lab. of Applied [Science] Harvard U., Cambridge, Mass.
MICROWAVE PROPERTIES AND APPLICATIONS OF GARNET MATERIALS, by G. P. Rodrigue. Scientific rept. no. 13 on Contract AF 19(604)1084. 15 Aug 57, 26p. 27 refs. AFCRC-TN-57-786; AD-133 740.
Order from LC mi$2.70, ph$4.80 PB 146 562

The known microwave properties of the new garnet materials are summarized briefly and compared to those of the more conventional ferrites. In order to facilitate the explanation of the operation of some new types of microwave devices, recent theories of ferromagnetic resonance developed by Suhl and by Walker are outlined. Possible applications of the yttrium garnet material include low frequency conventional microwave elements, frequency doublers and detectors, a new type of microwave limiter, and the recently announced ferromagnetic amplifier. The advantages that yttrium iron garnet offer in each of these devices are briefly discussed. (Author)

Horizons, Inc., Cleveland, Ohio.
FERROELECTRIC FILMS, by Richard A. Fotland. Final rept. on Contract AF 19(604)5499. Apr 60, 18p. 3 refs. AFCRC-TR-60-141.
Order from LC mi$2.40, ph$3.30 PB 148 817

Procedures have been evolved for preparing uniform 20 micron thick films of ferroelectric sodium niobate and barium-lead titanate ceramic materials. The procedure involves first grinding the materials to colloid size. The fine particles are then dispersed in water using a colloid mill and a deflocculent. Films are then formed on a glass plate, using an organic film as an interlayer, by pouring the suspension on the plate and allowing the water to evaporate. Separation of the film from the glass plate is accomplished by rapidly volatilizing the interlayer at a high temperature. Strict attention to details of cleanliness must be observed in order to prevent the formation of pinholes in the film. Vitrification of the films is performed with the films resting on a fine particle size, partially sintered zirconia layer. (Author)

Illinois U., Urbana.
COLOR CENTER REACTIONS IN THE ALKALI HALIDES, by Jack Kingsley. Technical note no. 2 on Research on the Electronic Properties of Nonmetallic Crystals, Contract AF 49(638)529. June 60, 129p. 40 refs. AFOSR-TN-60-635.
Order from LC mi$6.30, ph$19.80 PB 148 971

A variety of experiments have been performed with the object of understanding certain color center phenomena so as to shed light on the nature of the defects in the alkali halides and the mechanisms of their formation and destruction. More specifically, these experiments were directed toward the photoconductive, bleaching and restoration properties of the V_4 center and toward a study of the details of the processes involving the destruction of V_1 centers. The majority of the experiments were performed on potassium bromide.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
MOBILITY OF AN ELECTRON IN THE DONOR IMPURITY BAND OF A COMPENSATED SEMICONDUCTOR, by Alexei A. Maradudin and Barry S. Gourary (Applied Physics Lab., Johns Hopkins U.). Rept. on Contracts AF 18(600)1315 and NOrd-7386. Feb 60, 22p. 7 refs. Technical note. BN-190; AFOSR-TN-60-201; AD-234 103.
Order from LC mi$2.70, ph$4.80 PB 147 617

The motion of an electron is studied in an aperiodic one-dimensional potential consisting of a random linear array of attractive delta-function potentials of equal strength. It is shown that the ground state of this electron is nondegenerate, and that its energy is separated from that of the next higher energy state by a gap. These 2 results imply that mobility in such a system is an activated process. The relevance of the present model to impurity band conduction in nearly compensated semiconductors is pointed out, and its relation to the recent work of N. F. Mott [Can. J. Phys. 34:1356, 1956] is discussed. (Author)

Johns Hopkins U., Baltimore, Md.
STUDIES OF CONTACTS WITH BARRIERS IN BETWEEN, by Hans Meissner. Final rept. on Contract Nonr-248(49). Sep 59, 51p. 28 refs. AD-225 070.
Order from LC mi$3.60, ph$9.30 PB 148 889

Maryland U., College Park.
FREQUENCY SPECTRA OF LATTICES WHOSE PARTICLES INTERACT WITH LONG RANGE FORCES, by John A. Davies. Doctoral thesis. Rept. on Contract AF 49(638)399. Apr 60, 195p. 20 refs. Technical rept. no. 174; AFOSR-TN-60-386; AD-237 704.
Order from LC mi$8.90, ph$30.30 PB 149 538

The properties of the normal mode frequency spectra of lattices in which long range interactions exist between the lattice particles are studied for two- and three-dimensional crystal models. The models are (1) two-dimensional square lattices with either transverse vibrations normal to the plane of the lattice, or with longitudinal vibrations in the plane of the lattice; and (2) a three-dimensional simple cubic lattice. The types of interactions assumed to exist between lattice particle are pair potentials varying as inverse powers of the distance between the interacting particles. Long range interactions are found to give rise to types of singularities in the frequency spectrum, and its derivatives, which do not occur when only short range interactions exist in the lattice. The nature of these singularities is studied, and several examples are given. A treatment of lattice models having only short range interactions between constituent particles is given for purposes of comparison with the long range potential models. (Author)

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
COEFFICIENTS OF CONDENSATION AND EVAPORATION, by J. P. Hirth and G. M. Pound. Technical rept no. 3 on Contract Nonr-760(17). 15 Oct 59, 35p. 50 refs. AD-229 107.
Order from LC mi$3.00, ph$6.30 PB 149 474

Since the relation between the vapor pressure of a substance and the flux of the substance leaving a surface in equilibrium with the vapor was developed, there has been a vast research effort to investigate the quantity α_j ambiguously called the condensation coefficient, the evaporation coefficient, or the accomodation coefficient. In general, α_j in condensation does not equal α_j in evaporation under similar experimental conditions as was assumed by early investigators. Also, there are often several factors affecting α_j which may or may not be mutually independent. This has resulted in doubtful interpretations of α_j in the literature. Accordingly, the following treatment of the various factors affecting J_i is presented in order that the interaction of these factors might be better understood.

Microwave Lab., Stanford U., Calif.
WALKER MODES IN LARGE FERRITE SAMPLES, by B. A. Auld. Scientific rept. no. 20 on Contract AF 19(604)1930. Apr 60, 20p. 6 refs. M. L. rept. no. 709; AFCRC-TN-60-383.
Order from LC mi$2.40, ph$3.30 PB 149 247

The modes of resonance for a ferrite strip and a ferrite post resonator between conducting planes are found by taking appropriate combinations of uniform plane wave solutions. It is shown that magnetostatic resonances (Walker modes) may exist even when the resonator dimensions are arbitrarily large, provided the mode indices satisfy certain restrictions. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
TRANSMISSION LINE FORMULATION FOR SEMICONDUCTORS, by Herbert Kurss. Quarterly rept. no. 12, 1 Apr-30 June 59, on Contract DA 36-039-sc-73052. 28 Sep 59, 26p. Rept. R-523.35-59; PIB-453.35; AD-228 468.
Order from LC mi$2.70, ph$4.80 PB 146 454

A calculation of two points in the band structure of Lithium is tabulated with the aid of the new formulae for structure constants. The problem of determining those crystal planes which possess an orthogonal basis is reduced to a set of diophantine equations and, in a sense, solved. A priori constraints for the network

aspect of a set of coupled transmission lines are analyzed. These constraints are that the network conserve an inner product of terminal quantities where this inner product is (a) bilinear or (b) Hermitian-bilinear. (Author) (See also PB 145 896)

Naval Ordnance Lab., White Oak, Md.
RESEARCH ON PHOTOCONDUCTIVE FILMS OF THE LEAD SALTS, by Richard L. Petritz and James N. Humphrey. 13 Nov 57, 44p. 75 refs. NAVORD rept. 6042; AD-159 799.
Order from LC mi$3.30, ph$7.80 PB 147 227

A review is given of recent research on the photoconductive process in lead salt films. The paper begins with a discussion of the basic models of photoconductivity. The majority carrier model is then analyzed in detail and formulae for the responsivity, noise, and noise-equivalent power are developed. Experimental studies of the sensitization process barrier modulation, noise, quantum efficiency, responsivity, and noise-equivalent power are then discussed in terms of the majority carrier model. (Author)

Northwestern Technological Inst., Evanston, Ill.
TEMPERATURE AND COMPOSITION DEPENDENCE OF THE STRENGTH OF Al BASE Zn ALLOY SINGLE CRYSTALS, by J. Dash and M. E. Fine. Rept. on Contract AF 49(638)524. May 60, 16p. 19 refs. AFOSR-TN-60-524.
Order from LC mi$2.40, ph$3.30 PB 149 537

The critical resolved shear stress, σ_c, of zone-hardened Al base Zn alloys was found to increase with $c_{Zn})^{1/2}$ at room temperature, suggesting that the stress necessary to shear the zones is larger than that necessary to overcome the Mott-Nabarro misfit stresses. On cooling to 4.2°K, σ_c of a particular alloy (e.g. 5.3 at .% Zn) increases considerably more than predicted. This is attributed in part to off-center cutting of zones and in part to cutting of mismatch dislocations presumed to be located in the region between the core of the zone and the depleted shell.

Notre Dame U., Ind.
ELECTRON EMISSION FROM A SINGLE CRYSTAL, by E. A. Coomes. Reprint series. Technical rept. on Contract Nonr-1623(01). 12 Oct 59, 26p. 23 refs. AD-229 451.
Order from LC mi$2.70, ph$4.80 PB 149 511

A model for electron emission is presented which parallels volume transport theory and allows the interpretation of a number of perplexing experimental surface effects in a simple consistent manner. Use of the model raises the question of validity of assigning a surface potential barrier to the face of a perfect crystal. (Author)

Ohio State U. Research Foundation, Columbus.
STUDY OF THE MECHANISM OF ENDOTHERMIC REACTIONS PHOTOSENSITIZED ON SOLID SURFACES, by Jack G. Calvert. Final rept. on Contract AF 19(604)4069. Dec 59, 28p. 11 refs. AFCRC-TR-60-222; AD-233 258.
Order from LC mi$2.70, ph$4.80 PB 149 260

Samples of CdS, CdSe, and CdTe were prepared in our laboratory and/or obtained from commercial suppliers. The light-absorbing properties of the solids were determined by reflectance measurements. This work proved that CdS(s) is not suitable for use as a light-to-chemical energy converter in aqueous suspensions containing oxygen. CdSe(s)-O_2-H_2O(l) system also shown to be unsuitable as an energy converter in oxygen-containing aqueous systems. CdTe(s)-O_2-H_2O(l) system appeared to be ideally suited for consideration as a solar-to-chemical energy converter.

Pennsylvania U., Philadelphia.
INVESTIGATION OF PHYSICAL PROPERTIES OF SEMICONDUCTORS, by Max E. Caspari. Rept. on Research on Physical Phenomena Affecting the Characteristics of Electronic Components, Contract AF 33(616)3376. Apr 60, 53p. 9 refs. WADC Technical rept. 59-549.
Order from OTS $1.50 PB 161 903

Part of the research effort described in this report was devoted to the investigation of materials which may have interesting semiconducting properties at high temperatures. In particular solid solutions and compounds of metals and tungsten trioxide have been investigated. It was found that lead forms solid solutions with tungsten trioxide over a wide composition range but has metallic electrical properties. Copper tungstate and a compound containing a small amount of silver in tungsten trioxide were found to have interesting semiconducting properties. Aluminum boride was found to be a semiconductor with a large activation energy. Coupled with the preparation, chemical analysis and determination of electrical properties of these compounds, a crystal structure determination of triclinic copper tungstate was initiated. A study of the Faraday effect at microwave frequencies on n- and p-type germanium and silicon was carried out over a wide temperature range as a function of the static magnetic field, leading to information regarding the effective masses, life-times and mobilities of the charge carriers. Optical investigations of iodine single crystals showed the latter to be a semiconductor with a large activation energy. A large electrostrictive effect was measured in rutile single crystals and surface rather than volume imperfections were shown to have an effect on the breakdown strength in Harshaw KCl crystals. (Author)

Purdue Research Foundation, Lafayette, Ind.
SILICON CRYSTAL PERFECTION STUDY, by H. U. Yearian. Quarterly rept. no. 3, 1 Dec 58-28 Feb 59, on Contract DA 36-039-sc-77991. [1959] 29p. 9 refs.
Order from LC mi$2.70, ph$4.80 PB 149 110

Single crystals of Si have been pulled from a quartz crucible heated by a regulated carbon resistance furnace in either a He or A atmosphere. A small dislocation free seed was used with <111> growth axis. Initially there was no physical separation of the gas flowing over the crucible and the radiation shielded heater. Under these conditions the dislocation density was in the neighborhood of a few tens to a few hundred per cm^2 and twinning not associated with known changes in growing conditions occurred frequently. By isolating

the crucible gas from the heater, reducing gas contamination by hydrocarbon vapors, and by careful preparation of the seed, the dislocation density was reduced to less than $10/cm^2$ in favorable cases of seeding and growth control. The only twins observed were associated with an irregularity in the temperature control which can be eliminated. The factors affecting plastic deformation during crystal growth and the optimum growing conditions were formulated. A regulated RF converter and puller were installed for experiments on extending the small seed technique to pulling from a molten zone supported by surface tension on the end of a silicon rod. Preliminary experiments with unregulated equipment gave some promise of success. (Author) (See also PB 142 703)

Rutgers State U., New Brunswick, N. J.
X-RAY STUDY OF LATTICE DEFECTS IN FATIGUED SINGLE CRYSTALS, by A. Shrier, S. Weissmann, and J. J. Slade, Jr. Technical note no. 2 on Contract AF 49(638)17. July 60, 58p. 37 refs. AFOSR-TN-60-519.
Order from LC mi$3.60, ph$9.30 PB 149 154

Annealed silver single crystals grown from the melt with a (111) orientation were subjected to cyclic bending and were studied below and above the fatigue limit (10^7 cycles). High resolution x-ray methods were employed which included the Schulz reflection topography method, the x-ray reflection microscopy method with continuous speciment rotation, the double-crystal diffractometer method supplemented by x-ray reflection microscopy and the divergent x-ray beam back-reflection method. The x-ray studies were carried out as functions of increased number of cycles and position of specimen areas and were also supplemented by microhardness investigations. It was possible to discern three distinct stages in low-stress fatigue: in high-stress fatigue the effects of all three stages were juxtaposed and the characteristic fatigue phenomena developed at a higher rate.

Stanford Electronics Labs., Stanford U., Calif.
STUDIES OF MICROPLASMAS AND HIGH-FIELD EFFECTS ON SILICON. Final rept. on Contract DA 36-039-sc-78272. 15 Feb 60, 33p; AD-236 849.
Order from LC mi$3.00, ph$6.30 PB 149 411

This study is concerned with producing a p-n junction device for obtaining high internal fields perpendicular to a silicon surface. This device will ultimately be used to study microplasmas and high field effects in silicon. The work has proceeded in three steps. The first step was to achieve a reproducible diffusion process. The next step was the construction of the device itself. Essentially, the device is a guard ring diode with a very shallow junction which under reverse bias will, hopefully, avalanche uniformly over the junction area. In the avalanche condition the device emits light in the region of breakdown, the glow being produced by hot hole-hot, electron recombination in the high fields present. The devices constructed experienced avalanche breakdown in isolated spots rather than uniform breakdown over the junction area. The attempt to correlate these breakdown spots with surface imperfections led to the discovery that surface imperfections introduced during the construction of the device were directly related to the breakdown phenomenon. Attempts to understand the nature of the surface imperfections constitute the present stage of the research. (See also PB 147 933)

Stanford U., Calif.
THE SPECIFIC HEAT OF THE EXCHANGE SYSTEM OF SOME FREE RADICALS BETWEEN 1.6° AND $4.2^{\circ}K$, by J. P. Goldsborough, M. Mandel, and G. E. Pake. Rept. on Paramagnetic Resonance, Contract AF 18(603)131. June 60, 9p. 7 refs. Technical note no. 131-6; AFOSR-TN-60-585.
Order from LC mi$1.80, ph$1.80 PB 148 552

Portions of this report will not reproduce well.

Technical Research Group, Syosset, N. Y.
DEVELOPMENT OF THE PERIODIC SHOCK WAVE TECHNIQUE AND ITS APPLICATION TO THE PREPARATION OF SEMICONDUCTOR SILICON CARBIDE, by J. Dharma Teja. Final rept. for 15 Aug 57-15 Oct 59 on Contract AF 19(604)2665. Jan 60, 165p. 77 refs. TRG-117-FR; AFCRC-TR-60-105.
Order from LC mi$7.80, ph$25.80 PB 149 789

The periodic shock tube has been investigated as a high temperature device for the pyrolytic decomposition of various organo-silicon compounds, into silicon carbide. Temperatures in the range $1100^{\circ}F$ were produced in a periodic shock tube (gas driven jet resonance tube). Results of hundreds of experimental runs show that silicon carbide is obtained in a comparatively impure form in such a shock tube. Gram quantities of silicon carbide were thus prepared. X-ray diffraction analyses indicate that both α- and β-forms of silicon carbide are formed in the pyrolysis showing large temperature gradients in the shock tube. Since times of the order of one minute were employed in each experimental run, adequate time was not available for crystal growth, and hence only micro-crystalline silicon carbide is produced. (Author) (See also PB 138 704)

Watertown Arsenal Labs., Mass.
CRYSTALLOGRAPHIC AND MICROSTRUCTURAL CHANGES OCCURRING DURING THE GRAPHITIZATION OF A PETROLEUM COKE, by Aram Tarpinian. Jan 60, 46p. 25 refs. Technical rept. no. WAL TR 825.5/1; AD-234 186.
Order from LC mi$3.30, ph$7.80 PB 146 997

An analysis is made of the growth kinetics of carbon crystallites in a Gulf Coast crude petroleum coke. In the range of 2000° to $2500^{\circ}C$ an activation energy of 90 - 120 K cal/mol was determined for growth parallel to the c-axis; from 2500° to $2800^{\circ}C$ a lower activation energy of 20 - 30 K cal/mol was observed. Cathodic etching techniques were utilized to prepare powdered coke specimens for microstructural examination. Significant changes in microstructure were observed at approximately the same temperature range (2400° - $2500^{\circ}C$) in which the activation energy for crystallite growth changed to the lower value. (Author) (Several color photographs will not reproduce)

Air Force Missile Development Center, Holloman AFB, N. Mex.
PHENOMENOLOGICAL THEORY OF THE ONE-DIMENSIONAL STATIONARY SHOCK WAVE, by Bruno Manz. July 60, 140p. 15 refs. AFMDC TR-60-12.
Order from LC mi$6.90, ph$21.30 PB 149 306

Known results from the physics of shock waves are combined here with new results. The main features, or results, are: (1) a more refined application of the Second Law of Thermodynamics; (2) a critical review of the concept of a shock thickness as a criterion for the applicability of ordinary thermodynamics: (3) its replacement by a new criterion which is based on a formula of Enskog for the specific entropy of a heat-conducting viscous gas which departs from external equilibrium; (4) a mathematical discussion of the non-linear second-order differential equation for the velocity with respect to the possibility of oscillations occurring inside the shock zone; (5) an iteration method leading to the approximation of the original second-order differential equation by a first-order differential equation which is integrable; (6) the conclusion that the initial Mach number generally cannot exceed a certain limit which depends on the Prandtl number and which is infinite for Prandtl numbers greater than 0.56 (γ =1.4); (7) a closed-form solution for the velocity as an implicit function of x which holds for Prandtel numbers in the neighborhood of unity and for not-too-great initial Mach numbers. (Author)

Avco-Everett Research Lab., Mass.
COLLISION FREE MAGNETOHYDRODYNAMIC SHOCK WAVE, by A. Kantrowitz, R. M. Patrick, and H. E. Petschek. Rept. on Contracts AF 49(638)61 and Nonr-2524(00). Aug 59, 15p. 6 refs. Research rept. 63; [AFOSR TN-59-1190] AD-228 384.
Order from LC mi$2.40, ph$3.30 PB 148 187

It is assumed that the dissipation in a collision free shock produces a random distribution to magneto-hydrodynamic waves. These waves are then treated as the fundamental particles of the plasma. A rough kinetic theory is developed which estimates the heat conduction coefficient due to the waves. Using this heat conduction coefficient, the shock thickness is estimated to be about 4 times the characteristic ion Larmour radius. This prediction is in rough agreement with experimental results obtained in a MAST device. (Author)

Avco-[Everett] Research Lab., Mass.
SUPERSONIC TWO-DIMENSIONAL MAGNETOHYDRODYNAMIC FLOW, by F. Fishman, J. Lothrop and others. Rept. on Contracts AF 04(647)278 and AF 49(638)61. Feb 59, 50p. 7 refs. Research rept. 39; [AFOSR TN-59-290; AD-212 922]
Order from LC mi$3.30, ph$7.80 PB 147 199

The problem treated in this paper is the experimental and theoretical treatment of a two-dimensional supersonic flow problem. In order to emphasize the magnetohydrodynamic effects and minimize ordinary flow effects, a problem has been chosen in which there are virtually no solid bodies in the flow field, but only a magnetic field. This situation can be approximated by using the magnetic field of a loosely wound circular solenoid. A flow perpendicular to the axis of the solenoid will have only a weak interaction with the wire of the solenoid. For reasonable magnetic field strengths the interaction with the magnetic field of the solenoid can be much larger.

Centro di Studio per la Fisica Delle Microonde (Italy).
ON THE THEORY OF SOME CERENKOVIAN EFFECTS, by Giuliano Toraldo di Francia. Technical note no. 7 on Contract AF 61(052)67. Feb 60, 22p. 17 refs. AFCRC-TN-60-566.
Order from LC mi$2.70, ph$4.80 PB 149 583

The field generated by a charged particle in uniform straight motion is expanded into a set of evanescent waves. The expansion is valid in any half-space with no points in common with the path of the particle. The evanescent waves may impinge on the surface of an optical diffraction grating and be diffracted. Some of the diffracted waves turn out to be ordinary plane waves, which carry energy away from the grating. It is possible in this way to explain the Smith and Purcell effect and to derive some quantitative conclusions. (Author)

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
MAGNETOHYDRODYNAMIC SIMPLE WAVES (SUPPLEMENT) by Y. M. Lynn. Rept. on Contract AF 49(638)476. May 60, 25p. AFOSR Technical note TN-59-1302, sup.
Order from LC mi$2.70, ph$4.80 PB 148 929

In this supplement an exact analytic solution of the simple wave problem is presented, as well as some further computations of integral curves for fast waves. (Author)

Institute of Theoretical Physics, Stanford U., Calif.
ON A POSSIBLE NEW EXPERIMENTAL TEST OF GENERAL RELATIVITY THEORY, by L. I. Schiff. Technical note no. 12 on Contract AF 49(638)388. Feb 60, 10p. 8 refs. AFOSR-TN-60-199; AD-233 744.
Order from LC mi$1.80, ph$1.80 PB 147 616

An experiment is proposed that would provide a genuine test of the general theory of relativity. This consists of observation of the precession of the axis of a torque-free gyroscope that is either fixed in a laboratory (rotating with the earth), or located in a satellite. It is also suggested that a gyroscope made of a superconducting sphere supported by a static magnetic field might be used for this experiment, and possibly also for an experimental investigation of Mach's principle.

Physical Research Lab., Space Tech. Labs., Inc., Los Angeles, Calif.
EXCITATION OF ALFVEN WAVES, by Roy W. Gould. Rept. on Advanced Propulsion Systems, Contract AF 04(647)309. 24 May 60, 26p. 7 refs. STL/TR-60-0000-09143.
Order from LC mi$2.70, ph$4.80 PB 149 896

This memorandum examines the nature of waves which can propagate in a cold plasma which is immersed in a strong magnetic field and surrounded by a perfectly conducting cylinder.

Physical Research Lab., Space Tech. Labs., Inc., Los Angeles, Calif.
MAGNETIC PLASMA PROPULSION BY MEANS OF A TRAVELLING SINUSOIDAL FIELD, by Rudolf X. Meyer. Rept. on Contract AF 04(647)309. 30 Apr 60, 19p. 8 refs. STL/TR-60-0000-09114.
Order from LC mi$2.40, ph$3.30 PB 148 923

A theoretical model for electrodeless plasma propulsion by means of a time-dependent magnetic field is considered. The plasma is propelled by the peristaltic motion caused by an externally applied travelling magnetic field. The field is sinusoidal and purely transverse in the plane of symmetry. The model is based on the assumption of a fully ionized gas of finite conductivity. The conductivity is assumed to be sufficiently high to permit neglecting the kinetic energy associated with the leakage velocity of the plasma through the magnetic field. The plasma motion is therefore determined by the equilibrium of ponderomotive force and pressure gradient, and is somewhat analogous to the flow of a cold, viscous gas percolating through a porous medium. Temperature and conductivity can be shown to be approximately constant. The quantity of greatest interest is the pressure ratio sustained per half-wavelength of the applied magnetic field. An explicit expression for the case of zero magnetic Reynolds number is given in terms of an integral over the reciprocal of a Legendre elliptic integral. Numerical results are given. (Author)

Thermodynamics

AeroChem Research Labs., Inc., Princeton, N. J.
REACTION RATE DISTRIBUTIONS ON CATALYTIC SURFACES. II. COMPARISON OF EXACT AND APPROXIMATE FLAT PLATE SOLUTIONS FOR ASYMPTOTICALLY SMALL PRANDTL NUMBER, by Daniel E. Rosner. Rept. on Contracts AF 49(638)300 and AF 33(616)6216. Apr 60, 14p. 19 refs. Technical pub. no. 16; AFOSR-TN-60-690.
Order from LC mi$2.40, ph$3.30 PB 148 230

A chemical reaction rate distribution along a catalytic plate immersed in a uniform incompressible fluid stream containing a reactant in dilute amounts is shown to satisfy a familiar integral equation when the Prandtl number for diffusion ($Pr_D \equiv \nu/D$) asymptotically approaches zero. The closed form, exact solution to the catalytic plate problem provides a convenient standard against which two approximate methods, intended to span the entire range of Prandtl numbers, are compared. It is concluded from this comparison that global diffusion corrections $\bar{\eta}$ (= actual over-all conversion/chemically controlled conversion) computed assuming a constant (fictitious) reactant concentration along the catalytic surface probably represent exact solutions to the laminar diffusion layer equations (with first order chemical reaction) to within 4.8 percent over the entire range of Prandtl number $Pr_D = \nu/D$. (See also PB 140 809)

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
A STUDY OF FREE CONVECTION BOUNDARY LAYER OSCILLATIONS AND THEIR EFFECTS ON HEAT TRANSFER, by Jack P. Holman, Harold E. Gartrell, and Erich E. Soehgren. Dec 59, 42p. 7 refs. WADD Technical rept. 59-3.
Order from OTS $1.25 PB 161 941

Wave length, wave speed, and wave amplitudes of artificially induced oscillations in a free convection boundary layer on a vertical, isothermal, flat plate were measured with a Zehnder-Mach interferometer. It was found that, as the oscillations amplify in their movement up the plate, the wave energy increased more rapidly in the outer layers of the boundary layer than in the layers close to the wall. When the wave energy in the outer layers became sufficiently high transition to turbulence began. It was also observed that the time averaged heat transfer coefficient for the oscillating boundary layer was the same as the theoretical steady state value, within the range of the experimental error. (Author)

Avco-[Everett] Research Lab., Mass.
LAMINAR HEAT TRANSFER AROUND BLUNT BODIES IN DISSOCIATED AIR, by N. H. Kemp, P. H. Rose, and R. W. Detra. Rept. on Contract AF 04(645)18. May 58, 36p. 12 refs. Research rept. 15.
Order from LC mi$3.00, ph$6.30 PB 147 192

In the present work the local similarity differential equations are solved exactly, with variable external pressure gradient parameter, variable $\rho\mu$, and inclusion of the dissipation term. Lewis number effects are also discussed. This is accomplished numerically by an extension of the method which Fay and Riddel used at the stagnation point. The solutions which depend on the local external flow conditions, vary around the body, in contrast to the constant values used by Lees. Attention is restricted to bodies of revolution at zero angle of incidence. Results for two-dimensional bodies could be obtained by the same method.

Avco-[Everett] Research Lab., Mass.
A QUANTITATIVE RAPID RESPONSE ATOM DETECTOR, by Kurt L. Wray. Rept. on Contract AF 04(645)18. Mar 59, 16p. 5 refs. Research rept. 46.
Order from LC mi$2.40, ph$3.30 PB 146 659

A fine platinum wire resistance thermometer which serves as a rapid response atom detector is described. The platinum wire surface catalyzes the recombination of the atoms striking it and the liberated heat of recombination increases the temperature of the wire. In use, a constant electric current is passed through

the wire and the voltage drop across the wire is monitored as a function of time on an oscilloscope. Equations are developed which quantitatively relate the observed signal to the atom concentration when the detector is simultaneously subjected to atom flux and electrical heating. An electrical calibration technique is given for the detector which is independent of a known atomic concentration. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A METHOD OF DETERMINING THE HEAT CONDUCTIVITY COEFFICIENT OF A GAS WITH A SINGLE AC HEATED HOT WIRE, by Herbert J. Bomelburg. May 60, 19p. 3 refs. Rept. no. 1107.
Order from LC mi$2.40, ph$3.30 PB 149 238

A method is theoretically derived and experimentally verified for measuring the heat conductivity coefficient of a gas with a single ac heated hot wire. It is based on the determination of the phase lag between the heating current and the resulting temperature fluctuations of the wire. For temperatures up to about 300°C the experimental results were in good agreement with existing textbook data but at temperatures above 300°C systematic deviations are evident. This paper tries to give a possible explanation for this unexpected behavior. (Author)

Brown U. Div. of Engineering, Providence, R. I.
HEAT TRANSFER FROM SURFACES OF NON-UNIFORM TEMPERATURE DISTRIBUTION, FINAL REPORT. PART I. LOCAL RATES OF MASS TRANSFER FROM CYLINDERS IN CROSS FLOW, by H. H. Sogin, V. S. Subramanian, and R. J. Sogin. Rept. on Contract AF 49(638)46. May 60, 75p. 29 refs. AFOSR-TR-60-78.
Order from LC mi$4.50, ph$12.30 PB 149 597

This is an investigation of the distribution of the local rate of mass transfer from 4.2-in.-diameter naphthalene cylinders to air flowing normal to the axis. The air speeds, ranging from 58 to 166 ft/sec, are in the critical zone. The temperatures range from 73.6 to 84.7°F. The results in the laminar region have been compared with predictions based on the approximate boundary-layer calculations of H. Schuh and of H. J. Merk. Also, the results are compared with the heat transfer measurements of Schmidt and Wenner and of Zapp, and the mass transfer measurements of Winding and Cheney. The effect of changing the turbulence intensity of the main stream from 0.8 to 2.4 per cent by means of a wire grid is also presented. (Author) (See also PB 139 919)

Brown U. Div. of Engineering, Providence, R. I.
HEAT TRANSFER FROM SURFACES OF NON-UNIFORM TEMPERATURE DISTRIBUTION. FINAL REPORT, PART II. LOCAL SUBLIMATION FROM DISKS IN AXISYMMETRIC FLOW, by H. H. Sogin and V. Oskay. Rept. on Contract AF 49(638)46. July 60, 48p. 18 refs. AFOSR-TR-60-78.
Order from LC mi$3.30, ph$7.80 PB 149 598

The radial distribution of the local rate of mass transfer is measured on 4 in. naphthalene disks facing air streams in axisymmetric flow. The air speeds range from 71 to 128 ft/sec, and the temperature from 75 to 90°F. The results are compared with the solution by Merk. The effect of a change in turbulence intensity from 0.8 to 2.4 per cent is included. Experimental results on disks with inert central regions are compared with a wedge-type step function factor. (Author) (See also PB 149 597)

California Inst. of Tech., Pasadena.
GROWTH OF VAPOR BUBBLES IN A RAPIDLY HEATED LIQUID, by S. A. Zwick. Rept. on Contract Nonr-220(28). Sep 59, 21p. 7 refs. Engineering Div. rept. no. 85-13; AD-227 651.
Order from LC mi$2.70, ph$4.80 PB 148 895

The previous theory of the growth of vapor bubbles in superheated liquids is extended to the situation in which the rate of temperature rise of the liquid is large. Numerical solutions are presented for the early stages of bubble growth for various rates of liquid temperature rise. The asymptotic behavior of a bubble is found explicitly for a temperature rise of the liquid which is linear in the time. The asymptotic behavior consists of an early phase in which the radius increases like $t^{1/2}$ and a later phase in which the radius increases like $t^{3/2}$. These 2 phases are joined in a continuous manner. The $t^{3/2}$ solution occurs not only for rapid rates of temperature rise but also for moderate temperature rise rates provided the bubble growth is followed for a sufficiently long time. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
HEAT CONDUCTION IN A MELTING SLAB: AN EXACT SOLUTION, by R. W. Sanders. Technical note on Flight Sciences. July 60, 23p. 2 refs. LMSD-288274.
Order from LC mi$2.70, ph$4.80 PB 149 327

Transient heat conduction in melting finite solids is discussed. Solutions are determined for which the melting rate is inversely proportional to the amount of unmelted material. The solutions obtained demonstrate that a better measure of accuracy for any numerical procedure is its ability to predict the melting rate and not the grosser quantity — the total amount melted. (Author)

National Bureau of Standards, Washington, D. C.
THERMODYNAMIC FUNCTIONS FOR ATOMIC IONS, by Harold W. Woolley. Rept. on Contract SWR-53-1014. Apr 57, 114p. 28 refs. AFSWC-TR-56-34; AD-96 302.
Order from LC mi$6.00, ph$18.30 PB 150 099

This report released for sale to the public 30 Aug 60.

The calculation of equilibrium thermodynamics properties of a chemically reacting mixture of gases at such high temperatures that ionic forms are appreciably present is discussed with special consideration of cluster theory.

Ohio State U. Research Foundation, Columbus.
INFRARED EMISSION SPECTRUM OF GASEOUS HBO_2. THERMAL FUNCTIONS, by D. White, D. E. Mann and others. Technical rept. no. 3 on Contract Nonr-495(12). June 59, 22p. 11 refs.
RF Proj. 691; AD-220 495.
Order from LC mi$2.70, ph$4.80 PB 149 259

The system $B_2O_3(l) + H_2O(g)$ at elevated temperatures has been investigated spectroscopically in the infrared region 700 to 4000 cm^{-1}. A vapor species, HBO_2, has been identified at partial pressures of water in the range 1 to 15 mm and three emission bands of this molecule observed, at approximately 3680, 2030 and 1420 cm^{-1}. Approximate B^{-10}-B^{-11} and H-D isotope shifts are given.

Physical Research Lab., Space Tech. Labs., Inc., Los Angeles, Calif.
EXTENDED HYPERVELOCITY GAS DYNAMIC CHARTS FOR EQUILIBRIUM AIR, by Richard W. Ziemer. Rept. on Contract AF 04(647)309. 14 Apr 60, 43p. 3 refs. STL/TR-60-0000-09093.
Order from LC mi$3.30, ph$7.80 PB 149 218

The gas dynamic properties associated with a traveling normal shock, stationary normal shock, stagnation point, and reflected normal shock were computed for incident shock velocities of up to Mach 50. The computation, one of successive approximations and utilizing graphical thermodynamic data, has an estimated accuracy of 1 to 10 percent, with the major portion correct to within 5 percent. The properties of density, pressure, temperature, internal energy and enthalpy are plotted versus shock velocity for initial densities of 10^{-1} to 10^{-5} times atmospheric density and an initial temperature of 273.2°K. A Mollier diagram and an enthalpy-density cross-plot are included. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
ON NEAR-EQUILIBRIUM AND NEAR-FROZEN BEHAVIOR OF ONE-DIMENSIONAL FLOW, by Martin H. Bloom and Lu Ting. Rept. on Contract AF 40(600)732. July 60, 27p. 10 refs. AEDC TN-60-156; PIBAL R-525
Order from LC mi$2.70, ph$4.80 PB 149 747

Near-equilibrium and near-frozen one-dimensional inviscid flows downstream of an initial station at which the flow is in equilibrium have been examined by means of perturbation analyses. The near-equilibrium analysis requires the application of boundary layer techniques. The near-frozen analysis is of standard type. It is demonstrated that both types of flow behave in a frozen manner near the initial station. However the near-equilibrium flow quickly approaches the equilibrium behavior. Examples have been presented for both cases utilizing a dissociating model gas after Lighthill. Representative numerical results are included. (Author)

Princeton U., N. J.
ENTROPY PRODUCTION AND PRESSURE WAVES, by Gerald Rosen. Rept. on Project Squid, Contract Nonr-1858(25). June 59, 13p. 7 refs. Technical rept. PR-90-P.
Order from LC mi$2.40, ph$3.30 PB 146 538

Neglecting thermal conduction and viscous dissipation, the velocity-free equations of one-dimensional flow are derived with the inclusion of general fluid thermodynamics. The strength of finite amplitude pressure waves is introduced into the theory. This quantity is conserved if the entropy of each fluid particle remains constant with time. The growth or decay of the strength is examined for a perfect gas which produces entropy. (Author)

Stanford U., Calif.
THERMAL STRESS DUE TO DISTURBANCE OF UNIFORM HEAT FLOW BY CAVITIES AND INCLUSIONS, by J. N. Goodier and A. L. Florence. Rept. on Contract Nonr-225(29). 15 July 59. 101p. 3 refs. Div. of Engineering Mechanics technical rept. no. 120; AD-225 882.
Order from LC mi$5.70, ph$16.80 PB 147 799

Steady heat flow under a uniform temperature gradient in a linear isotropic homogeneous material does not induce thermal stress, if the body is free to expand. Thermal stress is induced, however, if the heat flow is distrubed by an inclusion of another material, or a cavity. Solutions are obtained of problems of this type concerning inclusions in thin plates, the special cases considered being the circular and elliptic inclusions and the insulated ovaloid hole. It was assumed that the surface of the plate is insulated. The problems are reduced to isothermal boundary load problems, and these are solved by the methods of N. I. Muskhelishvili, the regions of the inclusions being mapped conformally in the unit circle. Solutions are given of the 3-dimensional axi-symmetric problems of the spherical inclusion and the insulated prolate and oblate spheroidal cavities. Computations for the stress distribution around some prolate and oblate cavities are also presented. (Author)

Wave Propagation

Airborne Instruments Lab., Mineola, N. Y.
TIME-FREQUENCY VARIATION OF TROPOSPHERIC SCATTER PROPAGATION, by W. E. Landauer. Interim rept. no. 4, Feb-May 59, on Contract DA 36-039-sc-73276. 16 June 58, 16p. Rept. no. 4231-I-4.
Order from LC mi$2.40, ph$3.30 PB 149 020

Progress in the design and construction of the transmitter and receiver is discussed. (Author) (See also PB 149 019)

Airborne Instruments Lab., Mineola, N. Y.
TIME-FREQUENCY VARIATION OF TROPOSPHERIC SCATTER PROPAGATION, by W. E. Landauer. Interim rept. no. 5, June-12 Oct 58, on Contract DA 36-039-sc-73276. 31 Oct 58, 14p. Rept. no. 4231-I-5.
Order from LC mi$2.40, ph$3.30 PB 149 021

The receiver has been completed and is set up at the Département de Physique Appliquée of Compagnie Générale de Télégraphie Sans Fil at Orsay (Seine-et-Oise) France, for combined testing with the transmitter. As a result of these tests, a number of

changes are being made in the transmitter. Antennas for the proposed link have been mounted at link terminals. (Author) (See also PB 149 020)

Airborne Instruments Lab., Inc., Mineola, N. Y.
TIME-FREQUENCY VARIATION OF TROPOSPHERIC SCATTER PROPAGATION, by W. E. Landauer. Quarterly rept. no. 2, Aug-Oct 57, on Contract DA 36-039-sc-73276. 15 Nov 57, 23p. Rept. no. 4231-I-2; AD-161 432.
Order from LC mi$2.70, ph$4.80 PB 149 018

The desired frequency behavior of the carcinotron was obtained by means of 3 servo loops. The first loop slaves,the carcinotron frequency to the 14th harmonic of a frequency modulator. The linearity sweep period and endpoints of the carcinotron sweep are determined by the properties of this modulator, differing only by errors of the servo loop. A second servo loop fixes the endpoints of the modulator sweep. Crystal filters are used to provide pulses that invert the sweep direction of the modulator. The third servo loop controls the slope of the input applied to the modulator (and to the carcinotron) to ensure that the modulator reaches the inflection points of its frequency sweep in time coincidence with the sync pulses. This is accom plished by varying the gain of the amplifier in accordance with the time difference between the sync pulses and a set of pulses (called frequency pulses) that are coincident with the sweep inflection points. An error in the timing of the inflection points may require several sweep cycles for correction. For the receiver system, a super-heterodyne receiver with a tracking local oscillator was the most suitable. Tests on a local oscillator for the receiver are in progress.

Airborne Instruments Lab., Inc., Mineola, N. Y.
TIME-FREQUENCY VARIATION OF TROPOSPHERIC SCATTER PROPAGATION, by W. E. Landauer. Quarterly rept. no. 3, Nov 57-Jan 58, on Contract DA 36-039-sc-73276. 17 Feb 58, 19p. Rept. no. 4231-I-3; AD-159 114.
Order from LC mi$2.40, ph$3.30 PB 149 019

The design of the transmitter was revised because of difficulties encountered in the servo loop that was utilized to align the frequency inflection pulses with the synchronizing pulses. Instead of fixing the endpoints of the frequency sweep by crystal filters and using the difference in time between the frequency and synchronizing pulses to control the slope of the sweep voltage, the frequency sweep will be inverted at fixed moments of time, as determined by the synchronizing pulses. A voltage-sensing circuit at the discriminator output was used to identify the location of the signal frequency within the IF amplifier pass band. The AFC level sensor permitted data display only when the discriminator output was within limits corresponding to intermediate frequency within about 1 or 2 db of the peak response of the IF pass band. The characteristic of the discriminator is such that the second range of frequencies corresponds to frequencies at which the IF gain is more tha 40 db below its center frequency gain. An oscilloscope type of frequency-time-intensity display was chosen. Preliminary measurements were performed on the integrator that provides the sweep voltage. The IF amplifier, limiter, and discriminator were constructed. (See also PB 149 018)

Airborne Instruments Lab., Mineola, N. Y.
TIME-FREQUENCY VARIATION OF TROPOSPHERIC SCATTER PROPAGATION, by W. E. Landauer and J. C. Greene. Annual rept. (Final) on Contract DA 36-039-sc-73276. Feb 59, 47p. 2 refs. Rept. no. 4231-I.
Order from LC mi$3.30, ph$7.80 PB 149 022

A tropospheric scatter link has been established in France using a transmitter with a frequency that is swept in a triangular fashion between 3100 and 3600 Mc at a 10-cps sweep rate. A superheterodyne receiver, with a local-oscillator sweep synchronized with the transmitter sweep, is used to measure the amplitude of received signals as a simultaneous function of frequency and time. Preliminary data from this link show that there are many frequency bands within the swept-frequency range where the received signal level exceeds the median level by about 10 db. These privileged transmission bands are relatively stationary in frequency and time, being generally wider than 4 Mc (often 10 to 20 Mc wide) and persisting for periods of from 5 to 20 seconds. These data suggest the possibility of a scatter link using a frequency-seeking system to exploit the privileged transmission frequencies, and are also of considerable interest in the theory of scatter propagation. (Author)

Columbia U. School of Engineering, New York.
THE SPECTRAL DENSITY OF A MULTIPLY SCATTERED ELECTROMAGNETIC FIELD, by Dimitri S. Bugnolo. Doctoral thesis. Final rept. on Contract AF 49(638)350. 31 May 60, 89p. 8 refs. CU-13-60-AF-350-EE; AFOSR-TR-60-10.
Order from LC mi$4.80, ph$13.80 PB 149 783

This dissertation is concerned with the derivation of a transport equation for the spectral distribution of the photon density function in positional velocity space. The general theory is applied in detail to the case of multiple scattering by random dielectric noise and is independent of any particular model. A method of solution is developed for the special case of forward scattering. The results are applied in detail to the earth's troposphere.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
SIGNALS REFLECTED FROM THE MOON, by H. D. Webb. Final rept. for 1 Feb 57-31 Dec 59 on Contract DA 36-039-sc-73163. 29 Feb 60, 75p. 25 refs. AD-236 064.
Order from LC mi$4.50, ph$12.30 PB 149 015

The modifications made in the antenna and receiving equipment, and the development of supplementary equipment are described. The reception of moon reflections at 151.11 mc, 413 mc, and 448 mc are summarized. Other types of signal reception include satellite signals, signals at 151.11 mc by scatter mechanism, and radio noise from the sun and radio stars. A history of reflction of radio waves from the moon is given. A development of an equation for Faraday rotation in mks units is given. Some data were analyzed for Faraday rotation and some for amplitude fading. The Faraday rotation was used to calculate the change in electron content following ionospheric sunrise and shortly before sunset. Changes of about 1.8×10^{15} electrons/sq m/min were

obtained. Fading rates were analyzed by autocorrelograms. Propagation path attenuation is given, but the values are in doubt because of lack of knowledge of transmitter characteristics. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington, Mass.
RADIO REFRACTION IN A COOL EXPONENTIAL ATMOSPHERE, by J. R. Bauer, W. C. Mason, and F. A. Wilson. Rept. on Contract AF 19(122)458. 27 Aug 58, 32p. 9 refs. Technical rept. no. 186; AD-202 331.
Order from LC mi$3.00, ph$6.30 PB 147 347

Equations are derived for computing the height of a radar target or other radio scatterer as a function of observed (or virtual) slant range and elevation angle of arrival for the case of propagation through a spherically symmetric nondispersive atmosphere with an arbitrary refractive index distribution n(h). The method is applied to calculate propagation through the lower atmosphere when the refractive index of the troposphere obeys the exponential law $n(h) = 1 + \alpha \cdot \exp[-\beta h]$. When these results are compared with calculations based on the 4/3 earth's radius principle, serious discrepancies are found in the latter principle at ranges exceeding about 100 n. mi. Interpolated values of height vs range for the exponential model are tabulated in 10-n. mi. intervals of range to a maximum range of 360 n. mi., for elevation angles of 0^{o} to 90^{o}, to a maximum height of 100,000 feet.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
RELATION BETWEEN A CLASS OF TWO-DIMENSIONAL AND THREE-DIMENSIONAL DIFFRACTION PROBLEMS, by L. B. Felsen and S. N. Karp. Rept. on Contract AF 19(604)4143. 12 Jan 59, 26p. 7 refs. Scientific rept. no. R-694-58; PIB-622; AFCRC-TN-59-130; AD-210 493.
Order from LC mi$2.70, ph$4.80 PB 146 526

By means of a certain transformation, a relationship is demonstrated between a class of two-dimensional and three-dimensional scalar or electromagnetic diffraction problems. The basic three-dimensional configuration consists of a perfectly reflecting half plane excited by a ring source centered about the edge and having a variation $\exp(\pm i\phi/2)$, where ϕ is the azimuthal variable; in addition, a perfectly reflecting rotationally symmetric obstacle whose surface is defined by $f(\rho, z) = 0$ (ρ, z are cylindrical coordinates), may be superposed about the edge (z-axis). This problem is shown to be simply related to the two-dimensional one for the line source excited configuration $f(y, z) = 0$, where y and z are Cartesian coordinates. Various special obstacle configurations are treated in detail.

Motorola, Inc., Phoenix, Ariz.
ELECTROMAGNETIC PROPAGATION STUDY, by Robert J. Solem and John H. Thess. Semi-annual rept. for period ending 31 Mar 59 on Contract DA 36-039-sc-74841. [1959] 35p. 7 refs. AD-228 363.
Order from LC mi$3.00, ph$6.30 PB 149 371

Ducting (or trapping), a special case of tropospheric refraction, is shown to be a possible model of propagation of energy between two AN/PPN-13 equipments. This phenomena is described in terms of refractive modulus, and the mechanics of duct trapping are briefly presented from a qualitative ray-tracing aspect. Further, a background in meteorology, and those atmospheric conditions which lead to the formation of ducts, is presented. A study of the effects of multi-path propagation on AN/PPN-13 system distance-measuring accuracy is made. An equation for the envelope of the total response to two signals (a typical multi-path situation) is developed on the Appendix and applied to several examples of reflection percentages and time delays. These examples are illustrated and the indicated errors resulting from the various conditions imposed are tabulated. (Author)
(See also PB 149 371)

Motorola, Inc., Phoenix, Ariz.
ELECTROMAGNETIC PROPAGATION STUDY, by J. H. Thess. Semi-annual rept. for period ending 30 Sep 59 on Contract DA 36-039-sc-74841. [1959] 5 refs. AD-234 964.
Order from LC mi$3.00, ph$6.30 PB 148 334

The effects of multi-path propagation on the AN/PPN-13 and Tellurometer systems of distance measurement are experimentally investigated. Errors for various single reflection amplitudes and delays are experimentally determined in a laboratory multi-path simulation. Actual field data is collected and analyzed for operation over line-of-sight land paths with low ground clearance. System accuracy is shown to be unaffected by ground-reflected waves over this type of path. (Author)

National Bureau of Standards, Boulder, Colo.
AMPLITUDE AND PHASE OF THE LOW- AND VERY-LOW-RADIO FREQUENCY GROUND WAVE, by J. R. Johler, L. C. Walters, and C. M. Lilley. 1 June 60, 43p. 4 refs. Technical note no. 60.
Order from OTS $0.75 PB 161 561

Graphs and tables of the low- and very low-radio-frequency ground wave are presented as a function of frequency, 100 c/s to 1000 kc. (Author)

National Bureau of Standards, Boulder, Colo.
PROCEEDINGS OF THE 1960 CONFERENCE ON THE PROPAGATION OF E. L. F. RADIO WAVES HELD 26 JANUARY 1960. 6 June 60, 27p. 3 refs. Technical note 61.
Order from OTS $0.75 PB 161 562

Abstracts are given of the following papers:
Frequency spectra of transient e.m. pulses in a conducting medium
Measurements of the spectrum of radio noise from 50 to 100 cycles per second
Natural electromagnetic energy in frequencies below slow tail sferics band
Studies of natural electric and magnetic fields
A proposed experiment to determine ELF propagation characteristics

Electrical resistivity studies on the Athabasca Glacier, Alberta, Canada
Half wave cylindrical antenna in a dissipative medium: current and impedance
A very-low frequency antenna for investigating the ionosphere with horizontally polarized radio waves
Sub-audio frequency (1 to 50 c/s) geomagnetic fluctuations at Denver, Colorado
Dipol radiation in a conducting half-space
Possible application of the system loss concept at ELF
Some ELF phenomena
Field strength measurements in fresh water
Slow tails from intra-cloud lightning discharges
Mode theory and the propagation of E.L.F. radio waves
ELF electric fields from thunderstorms
Useful radiation from an underground antenna

RCA Victor Co., Ltd. (Canada).
ELECTROMAGNETIC WAVE PROPAGATION OVER THE SURFACE OF THE EARTH (ELECTROMAGNETIC WAVE PROPAGATION OVER NATURAL OBSTACLES). Final rept. on Contract AF 19(604)3049. Mar 60, 104p. 30 refs. AFCRC-TR-60-138-1.
Order from LC mi$5.70, ph$16.80 PB 148 790

Scale model laboratory experiments have been utilized to simulate the propagation of electromagnetic waves over the surface of the earth. The major advantage of the scale model techniques has been the ease with which control can be exercised over the pertinent parameters. As a result, the influence of critical factors could be specifically ascertained. Two general aspects of propagation over the earth's surface have been of concern, namely, the effect of the shape of dominant obstacles, such as mountains, on wave propagation and secondly the effect of the location and nature of reflecting ground on the radio energy at the receiving site. This report deals with electromagnetic wave propagation over dominant obstacles.

Stanford Electronics Labs., Stanford U., Calif.
NIGHT-TIME EQUATORIAL PROPAGATION AT 50 Mc/s; FINAL RESULTS FROM AN IGY AMATEUR OBSERVING PROGRAM, by M. P. Southworth. Final rept. on Contract AF 19(604)5235. 31 May 60, 142p. 16 refs. [AFCRC] TR-60-281.
Order from LC mi$7.20, ph$22.80 PB 149 307

Transequatorial scatter or "TE" causes vhf signals to propagate over 5,000-10,000-km transequatorial paths during the evening hours. Diurnal and seasonal plots are presented for typical paths, and it is concluded that there are actually two kinds of evening transequatorial propagation. The first type provides steady signals and is best between 1800 and 1900 local time. The second gives signals a deep flutter fade and maximizes at 2000-2200 local time. Both types occur most often during the equinoxes. The optimum path for both is one symmetrical both geographically and magnetically to the magnetic dip equator, normal to the magnetic equator and about 6000 km long. Amateurs often make contacts over distances of 200-4000 km at the same time TE is present. Amateur work in South America is compared with results from 50- to 50-Mc backscatter soundings made at Puerto Rico. TE is shown to correlate negatively with magnetic activity and positively with spread F and with the height of the F-layer on the equator at 1900 local time. Either magnetic or h'F data for this hour can be used to predict spread F and TE a few hours later, especially at the equinoxes. The early type of TE is believed to involve the "billiard ball" mode in which there are two successive reflections from either side of the equatorial bulge in the ionosphere without any intermediate ground reflection. The type of TE with fluttery signals is believed to be F scatter from turbulence caused by the collapsing equatorial bulge.

Woods Hole Oceanographic Institution, Mass.
RADIATION OF WAVES FROM A POINT SOURCE, by Robert McKelvey. Technical rept. on Contract Nonr-891(00). May 59, 15p. 3 refs. Reference no. 59-23.
Order from LC mi$2.40, ph$3.30 PB 146 570

The object of this note is to obtain an expression for a radiation solution of the wave equation in medium which is in general inhomogeneous and non-isotropic. The form of solution obtained is identical with that found by the method of Hadamard. We give a direct verification which avoids many of the complications of that method but which preserves its spirit. The particular case of an isotropic continuously stratified medium is worked out in detail. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Naval Ordnance Test Station, China Lake, Calif.
EXPERIMENTAL DESIGN AND USEFUL TECHNIQUES OF ANALYSIS, by R. L. Eidemiller. 2 Apr 59, 60p. 21 refs. NOTS TP 2186; NAVORD rept. 6466; AD-216 636.
Order from LC mi$3.60, ph$9.30 PB 147 608

The planning and conducting of statistically designed experiments and the selection of actual designs are discussed. Several techniques that are useful in the analysis of observed data of an experiment are included: (1) an IBM 704 program for computation and analysis, (2) two methods for estimating missing values, (3) Tukey's method for individual mean comparisons, (4) attribute analysis techniques including Fisher's "Exact Method" and Batson's proposed "Factorial Chi-Square Analysis," and (5) Box's technique for optimizing a response surface including a numerical example. The appendixes contain many fractional factorial designs that are ready for use, and a direct entry table for Fisher's exact method for analyzing a 2 x 2 contingency table. (Author)

Naval Ordnance Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS. Quarterly rept. for Jan-Mar 60. June 60, 42p. 17 refs. NAVWEPS rept. 5996; NOLC rept. 503.
Order from LC mi$3.30, ph$7.80 PB 149 084

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Communication stochastics
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High temperature polymer program
Infrared atomic spectra
Semiconductor physics
(See also PB 147 512)

SOCIAL SCIENCES

Applied Mathematics and Statistics Labs., Stanford U., Calif.
COMPETITIVE STABILITY UNDER WEAK GROSS SUBSTITUTABILITY: NONLINEAR PRICE ADJUSTMENT AND ADAPTIVE EXPECTATIONS, by Kenneth J. Arrow and Leonid Hurwicz. Technical rept. no. 78 on Contract Nonr-225(50). 12 Oct 59, 33p. 17 refs.
Order from LC mi$3.00, ph$6.30 PB 149 487

McKenzie's dynamic system, which is the most general yet proposed, is considered, and it is demonstrated that if there exists at least one strictly positive equilibrium, then the path defined by the dynamic system from any starting point will converge to a limit which, of course, must be an equilibrium. This theorem is stronger than McKenzie's in the sense that the type of stability proved is somewhat stronger. The method of proof is somewhat novel. (See also PB 147 058)

California U., Los Angeles.
AN ECONOMIC ANALYSIS OF THE SHORT RUN EQUILIBRIUM OF A JOB SHOP--AN EXTENSION OF THE THEORY OF THE FIRM, by Yoshiro Kuratani. Rept. on Management Sciences Research Proj. [Contract Nonr-223(02)] 8 July 58, 11p. 1 ref. Discussion paper no. 71.
Order from LC mi$2.40, ph$3.30 PB 148 837

An economic analysis on the job shop's behavior heretofore unattempted in the traditional economic analysis. Attention has generally been focused on the type of the firm which produces for the market and not to customers' orders. The analysis of the present paper is aimed toward firms producing to fill orders already on hand. The presentation is general and applies to many subcontractor types of firms in whose operation delivery time plays a strategic role. (Author)

California U., Los Angeles.
PRICE-TEMPORAL EQUILIBRIUM -- AN EQUILIBRIUM ANALYSIS OF MARKETS UNDER CONTRACTS, by Yoshiro Kuratani. Rept. on Management Sciences Research Proj. [Contract Nonr-223(02)] 12 May 59, 16p. 4 refs. Discussion paper no. 72.
Order from LC mi$2.40, ph$3.30 PB 148 838

A standard demand and supply analysis seldom goes beyond price and quantity dimensions and even in the case where a third factor, quality variations for example, is considered, the other independent variable namely, price, is treated as a parameter. While this approach has a great merit of simplicity, it is bound to become utterly inadequate when the parametric treatment of one factor grossly distorts the market behavior due to the wilful neglect of the interrelation among the factors. The analysis presented here aiming at the behavior of the market under contracts is the first step towards constructing a more general theory of the firm which considers eventually all the relevant factors simultaneously, including the traditional demand and supply analysis as a special case. (Author)

California U., Los Angeles.
UCLA EXECUTIVE DECISION GAMES, by James R. Jackson. Rept. on Management Sciences Research Proj. [Contract Nonr-223(02)] 9 Dec 58, 7p. Research rept. no. 58.
Order from LC mi$1.80, ph$1.80 PB 148 835

This report consists of a brief description of UCLA Executive Decision Game No. 2, and an even shorter preliminary description of the new Game No. 3.

Minnesota U., Minneapolis.
PORTS AND ECONOMIC DEVELOPMENT IN BORNEO, by Jan O. M. Broek. Final rept. on Contract Nonr-710(09). June 59, 26p.
Order from LC mi$2.70, ph$4.80 PB 146 409

Minnesota U., Minneapolis.
TRADE AND TRADE CENTERS OF SARAWAK, by Jan O. M. Broek. Technical rept. no. 3 on Contract Nonr-710(09). June 59, 41p. 17 refs.
Order from LC mi$3.30, ph$7.80 PB 146 410

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS, Sep 60.
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Scientific program:
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Astronomy and Astrophysics: Observations of enhanced solar radiation at centimeter and millimeter wavelengths
Chemistry: Effect of high temperature on the formation of insolubles in jet fuel. Corrosion of stainless steels exposed to tropical environments over a period of 8 years
Mechanics: Minimum toughness requirements for high-strength sheet steel. Instrumentation for high-speed strain testing. Thermoelectric power measurements on dehydrogenated palladium. Hydrodynamic forces on a vibrating cylinder close to a rigid wall (part 1). Methods for determining natural frequency of piezoelectric accelerometers. Impact damage to materials inflicted by 0.2-gm projectiles fired in excess of 22,000 ft/sec by an improved light-gas gun
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high-temperature apparatus for studying the radiant energy transmission properties of beryllium oxide. Formation rate of $CbZn_3$ on columbium in zinc vapor. Oxidation study of metals containing zinc in solid solutions. Vacuum-stream degassing of aluminum alloys (analysis control). Stability of protective spinel films on steel under conditions encountered in steam power systems

Nuclear and Atomic Physics: Neutral pion lifetime. On tables of integrals related to the Planck radiation function

Optics: An f/6.6 high-dispersion, time-resolving, grating spectrograph

Radio: Passive transistor-core electronic computer switching circuits. Satellite communication systems (ECHO I and CMR)

Solid State Physics: Dynamic proton spin polarization. Design and instrumentation of a Pound-Watkins nuclear magnetic-resonance spectrometer. On the nature of vibrational modes in ionic crystals. K-series x-ray excitation efficiencies for bulk specimens

Sound: Mechanical self-resistance and mechanical mutual resistance of unbaffled rigid disk (ka 1) radiating sound from a single face into an acoustic medium. Radiation mechanical impedance of multizone radiators in a prolate spheroidal baffle

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Naval Research Lab., Washington, D. C.
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Parametric amplifiers in radar astronomy, by F. Wrigley, K. J. Craig, and B. S. Yaplee

Trace analysis and its application at NRL, by S. H. Cress and O. R. Gates

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Astronomy and Astrophysics: Atmospheric scattering of visible and infrared radiation

Chemistry: Effect of chemical structure on the spontaneous ignition of hydrocarbons. Synergistic surface tension effects from mixtures of fluorinated alcohols with conventional wetting agents. Analysis of contaminants in aviators' breathing oxygen

Mechanics: Effect of differential temperatures on the fracture toughness of stretch-oriented MIL-P-8184 acrylic. Absolute thermoelectric power measurements on Pd-Ni specimens at temperatures from that of liquid nitrogen to about 0°C. Probability of an incapacitation as a function of height above ground

Metallurgy and Ceramics: Fracture toughness of high-strength sheet titanium alloys. Crystallographic study of Cb_2Zn_3. Preliminary data on post-irradiation heat treatment for recovery of material properties. Progress report on the protection of refractory metals for high-temperature service. Performance of galvanic anode cathodic protection system for Navy ships

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Biology and Medicine

Semiannual report to The Atomic Energy Commission, by L. O. Jacobson and M. Doyle. Argonne Cancer Research Hospital, Chicago, Ill. Mar 60. Contract AT-(11-1)-69. 118p. Order from OTS. $2.75. ACRH-13

Metabolism of W^{185} in the rat, by J. E. Ballou. Hanford Atomic Products Operation, Richland, Wash. Mar 60. Contract AT(45-1)-1350. 12p. Order from OTS. 50 cents. HW-64112

Blast biology. Technical progress report, by C. S. White and D. R. Richmond. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Sep 59. Contract AT (29-1)-1242. 89p. Order from OTS. $1.00. TID-5764

A trapezoidal-wave electromagnetic blood flowmeter, by H. M. Yanof and P. Salz. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. June 60. Contract W-7405-eng-48. 42p. Order from OTS. $1.00. UCRL-9204

Toxicology of beryllium: A bibliography, by E. D. Hutchinson and others. The University of Rochester, Rochester, N. Y. Mar 60. Contract W-7401-eng-49. 74p. Order from OTS. $2.00. UR-570

The accumulation of Po^{210} in the rat during multiple inhalant exposures, by H. L. Berke and A. C. Di Pasqua. The University of Rochester, Rochester, N. Y. July 60. Contract W-7401-eng-49. 35p. Order from OTS. 75 cents. UR-573

Biological effects of nuclear radiation on the monkey (Macaca Mulatta): Two-year evaluation, by J. E. Pickering and others. School of Aviation Medicine, U. S. Air Force, Brooks Air Force Base, Tex. June 59. 51p. Order from OTS. $1.25. WT-1542

Chemistry—General

Kinetics of dissolution of zirconium in molten uranium, by G. H. Golden. Argonne National Laboratory, Argonne, Ill. May 60. Contract W-31-109-eng-38. 38p. Order from OTS. $1.00. ANL-6167

Counting individual alpha activities in mixtures, by J. Sadauskis. Argonne National Laboratory, Argonne, Ill. June 60. Contract W-31-109-eng-38. 20p. Order from OTS. 50 cents. ANL-6186

Nuclear magnetic resonance spectra of traialkyl phosphates and related compounds. I. Proton magnetic resonance spectra, by W. E. Shuler and R. C. Axtmann. E. I. du Pont de Nemours & Co. Explosives Department, Atomic Energy Div., Technical Div., Savannah River Laboratory, Aiken, S. C. June 60. Contract AT(07-2)-1. 48p. Order from OTS. $1.50. DP-474

Thermodynamic and transport properties of helium, by M. P. Wilson, Jr. General Dynamics Corp., Electric Boat Div., San Diego, Calif. Jan 60. Contract AT(04-3)-187. 144p. Order from OTS. $2.75. GA-1355

Corrosion control of copper and steel by vacuum deaeration, by M. E. Tester. Goodyear Atomic Corp., Technical Div., Process Engineering Dept., Portsmouth, Ohio. May 60. Contract AT-(33-2)-1. 14p. Order from OTS. 50 cents. GAT-296

A versatile autoclave facility for aqueous corrosion research, by V. H. Troutner. Hanford Atomic Products Operation, Richland, Wash. Contract

AT(45-1)-1350. 30p. Order from OTS. 75 cents. HW-64111

Decomposition of nitrous oxide. Final report, by J. H. Zufall and H. S. Miller. Phillips Petroleum Co., Atomic Energy Division, Idaho Operations Office, Idaho Falls, Idaho. July 60. tract AT(10-1)-205. 19p. Order from OTS. 50 cents. IDO-14513

Transport numbers in pure fused zinc chloride, by A. Lundén. Iowa State University of Science and Technology, Ames Laboratory, Ames, Iowa. Apr 60. Contract W-7405-eng-82. 34p. Order from OTS. $1.00. IS-114

Improved U^{235} measurements at the Paducah Plant through refinements in the gravimetric oxide dilution procedure, by R. F. Smith, R. E. Eby, and C. W. Turok. Union Carbide Nuclear Co., Union Carbide Corp., Paducah Plant, Paducah, Ky. July 60. Contract W-7405-eng-26. 14p. Order from OTS. 50 cents. KY-349

Tabulated values of thermal diffusion column shape factors for the Lennard-Jones (12-6) potential, by B. B. McInteer and M. J. Reisfeld. The University of California, Los Alamos Scientific Lab., Los Alamos, N. Nex. Oct 59. Contract W-7405-ENG-36. 56p. Order from OTS. $1.75. LAMS-2413

Thermal conductivity and thermal expansion of B_eO at elevated temperatures, by R. E. Taylor. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Cnntract AT(11-1)-GEN-8. 19p. Order from OTS. 75 cents. NAA-SR-4905

P-V-T relationships of BF_3 gas, by C. R. F. Smith. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 31p. Order from OTS. 75 cents. NAA-SR-5286

The cadmium--cadmium halide systems, by L. E. Topol and A. L. Landis. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 15p. Order from OTS. 50 cents. NAA-SR-5310

Liquidus curves for molten alkali metaphosphate-sulfate systems, by S. W. Mayer and others. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 15p. Order from OTS. 50 cents. NAA-SR-5334

The thermostability of thorium tetraiodide, by A. L. Landis and A. J. Darnell. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 15p. Order from OTS. 50 cents. NAA-SR-5394

Green salt Pilot Plant final report, by R. Braddock and others. Mallinckrodt Chemical Works, St. Charles, Mo. Mar 43. Decl. July 12, 1960. 54p. Order from OTS. 50 cents. NYO-5029

Hydrides of metals and metalloids. A literature search. Tufts University, Medford, Mass. July 60. 164p. Order from OTS. $2.75. TID-3902

I. Beta-spectroscopic studies in the promethium region. II. The coriolis interaction in deformed nuclei. Thesis, by T. V. Marshall. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. May 60. Contract W-7405-eng-48. 73p. Order from OTS. $1.75. UCRL-8740

Fission of gold with 112-Mev C^{12} ions: A yield-mass and charge-distribution study. Thesis, by H. M. Blann. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. May 60. Contract W-7405-eng-48. OTS $1.75. UCRL-9190

Thermal ignition and response of materials, by K. P. Laughlin. Office of Civil and Defense Mobilization, Battle Creek, Mich. July 60. 58p. Order from OTS. $1.25. WT-1198

Preparation of dense, spheroidal UO_2, by R. P. Levey, Jr. Union Carbide Nuclear Co., Division of Union Carbide Corp., Y-12 Plant, Oak Ridge, Tenn. Aug 60. Contract W-7405-eng-26. 25p. Order from OTS. 50 cents. Y-1299

Preparation of uranous oxalate, by L. R. Phillips and others. Union Carbide Nuclear Co., Division of Union Carbide Corp., Y-12 Plant, Oak Ridge, Tenn. Aug 60. Contract W-7405-eng-26. 18p. Order from OTS. 50 cents. Y-1308

Chemistry—Radiation and Radiochemistry

Radiation processing report no. 1: Gamma irradiation experiments in the N_2-O_2 system, by M. Steinberg. Brookhaven National Laboratory, Associated Universities, Inc., Upton, N. Y. June 60. 17p. Order from OTS. 50 cents. BNL-612(T-182)

Radiation processing report no. 2: Irradiation of NH_3-H_2O solutions for formation of hydrazine, by M. Steinberg and others. Brookhaven National Laboratory, Upton, N. Y. June 60. 7p. Order from OTS. 50 cents. BNL-613(T-183)

Precipitation of radioruthenium, by F. E. Butler. E. I. du Pont de Nemours & Co. Explosives Dept., Atomic Energy Div., Technical Div., Savannah River Laboratory, Aiken, S. C. June 60. Contract AT(07-2)-1. 11p. Order from OTS. 50 cents. DP-494

The mass spectra of deuterated biphenyls: mechanisms of hydrogen and carbon loss processes, by J. C. Burr, J. M. Scarborough and R. H. Shudde. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 29p. Order from OTS. 75 cents. NAA-SR-4960

Some factors correlating the rates of gas formation in the radiolysis of aromatic hydrocarbons, by J. G. Burr and J. D. Strong. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 11p. Order from OTS. 50 cents. NAA-SR-4962

Chemistry—Separation Processes for Plutonium and Uranium

Chemical Engineering Division summary report for January, February, March, 1960, by S. Lawroski and others. Argonne National Laboratory, Argonne, Ill. 1960. Contract W-31-109-eng-38. 192p. Order from OTS. $2.75. ANL-6145

Reactor chemistry, by S. Peterson and R. W. Stoughton. Oak Ridge National Laboratory, Oak Ridge, Tenn. May 54. Decl. July 8, 1960. 53p. Order from OTS. 50 cents. CF-54-4-198(Rev.)

Separation processes, by I. Perlman. Argonne National Laboratory, Argonne, Ill. Sep 46. Decl. Aug 2, 1960. Contract W-31-109-eng-38. 72p. Order from OTS. 55 cents. CN-3627

Shear development for the nonproduction fuel reprocessing program. Interim report, by V. P. Kelly. Hanford Atomic Products Operation, Richland, Wash. July 60. Contract AT(45-1)-1350. 42p. Order from OTS. $1.00. HW-62842

Reprocessing uranium-molybdenum alloy fuels - dissolution in concentrated nitric acid, by W. W. Schulz. Hanford Atomic Products Operation, Richland, Wash. Mar 60. Contract AT(45-1)-1350. 16p. Order from OTS. 75 cents. HW-64432

Idaho Chemical Processing Plant technical progress report for April through June 1956, by C. E. Stevenson. Phillips Petroleum Co., Idaho Falls, Idaho. Jan 57. Decl. July 6, 1960. Contract AT(10-1)-205. 54p. Order from OTS. 50 cents. IDO-14391

Tributyl phosphate extraction of uranium from ammonium nitrate solutions, by K. L. Rohde and R. A. Kent. Phillips Petroleum Co., Idaho Chemical Processing Plant, Idaho Falls, Idaho. July 60. Contract AT(10-1)-205. 16p. Order from OTS. 50 cents. IDO-14501

Idaho Chemical Processing Plant technical progress report for July through September, 1959, by C. E. Stevenson. Phillips Petroleum Co., Idaho Falls, Idaho. June 60. Contract AT(10-1)-205. 92p. Order from OTS. $2.25. IDO-14509

Idaho Chemical Processing Plant technical progress for October through December 1959, by C. M. Slansky and others. Phillips Petroleum Co., Idaho Falls, Idaho. June 60. Contract AT(10-1)-205. 85p. Order from OTS. $2.00. IDO-14512

Report of the Chemistry and Chemical Engineering Section for February, March, April, 1956, by D. H. Ahmann and others. General Electric Co., Knolls Atomic Power Laboratory, Schenectady, N. Y. July 56. Decl. July 8, 1960. Contract W-31-109-Eng-52. 98p. Order from OTS. 60 cents. KAPL-1536

Report of the Chemistry and Chemical Engineering Section for August, September, October, 1956, by D. H. Ahmann and others. General Electric Co., Knolls Atomic Power Laboratory, Schenectady, N. Y. Jan 57. Decl. July 8, 1960. Contract W-31-109-Eng-52. 105p. Order from OTS. 65 cents. KAPL-1620

Operation of the piqua OMR degasification system prototype, by G. W. Corporales and P. R. Benson. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Aug 60. Contract AT(11-1)-GEN-8. 36p. Order from OTS. 75 cents. NAA-SR-4894

Corrosion data from the ORNL Purex Pilot Plant acid recovery equipment, by J. W. Landry and J. W. Ullmann. Oak Ridge National Laboratory, Chemical Technology Division, Oak Ridge, Tenn. Mar 52. Decl. June 18, 1960. Contract W-7405-eng-26. 71p. Order from OTS. 55 cents. ORNL-1210

Dissolution of uranium-zirconium fuel elements in fused $NaF-ZrF_4$, by R. G. Wymer and J. F. Land. Oak Ridge National Laboratory, Chemical Technology Division, Oak Ridge, Tenn. Feb 57. Decl. July 6, 1960. Contract W-7405-eng-26. 26p. Order from OTS. 35 cents. ORNL-2183

Controlled Thermonuclear Processes

Development of reliable 20 KV, size a ignitrons for thermonuclear research, by G. P. Boicourt, E. L. Kemp, and F. K. Tallmadge. The University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. July 60. Contract W-7405-ENG-36. 46p. Order from OTS. $1.00. LAMS-2416

Quarterly status report of the LASL Controlled Thermonuclear Research Program for period ending May 20, 1960, by S. Glasstone. The University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. July 60. Contract W-7405-ENG-36. 59p. Order from OTS. $1.50. LAMS-2444

A beam inflector, by F. C. Gilbert. University of California, Lawrence Radiation Laboratrry, Livermore, Calif. Nov 59. Contract W-7405-eng-48. 7p. Order from OTS. 50 cents. UCRL-5698

High-energy molecular ion injection into a mirror machine, by F. C. Gilbert and others. University of California, Lawrence Radiation Laboratory, Livermore, Calif. Feb 60. Contract W-7405-eng-48. 26p. Order from OTS. 75 cents. UCRL-5827

Tables of functions involved in linear pinch stability criteria, by J. Killeen, W. A. Newcomb, and J. S. Vandergraft. University of California, Lawrence Radiation Laboratory, Livermore, Calif. Mar 60. Contract W-7405-eng-48. 9p. Order from OTS. 50 cents. UCRL-5885

Controlled Thermonuclear Research quarterly report for December 1958, January, and February 1959. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Mar 59. Decl. February 15, 1960. Contract W-7405-eng-48. 81p. Order from LC. Mi $4.50, ph $12.30. UCRL-8682

Controlled Thermonuclear Research quarterly report for December 1959, January, February 1960. University of California. Lawrence Radiation Laboratory, Berkeley and Livermore, Calif. Mar 60. Contract W-7405-eng-48. 122p. Order from OTS. $2.75. UCRL-9106

Criticality Studies

Plutonium plexiglas assemblies, by C. L. Schuske and others. Dow Chemical Co., Rocky Flats Plant, Denver, Colo. Man 60. Decl. February p6, 1960. Contract AT(29-1)-1106. 20p. Order from LC. Mi $2.40, ph $3.30. RFP-178

Criticality studies of enriched uranium metal in $UO_2(NO_3)_2$ solutions, by A. Goodwin, Jr., G. H. Bidinger, and C. L. Schuske. The Dow Chemical Co., Rocky Flats Plant, Denver, Colo. July 60. Contract AT(29-1)-1106. 19p. Order from OTS. 50 cents. RFP-182

Plutonium plexiglas assemblies. Part II, by G. H. Bidinger, C. L. Schuske, and D. F. Smith. The Dow Chemical Company, Rocke Flats Plant, Denver, Colo. July 60. Contract AT(29-1)-1106. 22p. Order from OTS. 50 cents. RFP-190

Equipment, Methods and Techniques

A bibliography on gas lubricated bearings, revised, E. B Sciulli. Franklin Institute, Laboratories for Research and Development, Philadelphia, Pa. Sep 59. Contract Nonr-2342(00) Task NR 097-343. 104p. Order from OTS. $2.50. AECU-4440

Refinements of the theory of the infinitely-long, self-acting, gas-lubricated journal bearing. Interim report, by H. G. Elrod, Jr. and A. Burgdorfer. Franklin Institute, Laboratories for Research and Development, Philadelphia, Pa. Jan 60. Contract Nonr-2342(00. 48p. Order from LC. Mi $3.30, ph $7.80. AECU-4688

Isotopic method for age determinations of industrial products. Monthly progress letter for January 1960, by T. C. Gregson and L. B. Bangs. Goodyear Tire and Rubber Co., Akron, Ohio. Contract AT(11-1)-729. 5p. Order from LC. Mi $1.80, ph $1.80. AECU-4711

An analysis of several of the variables encountered in low cycle fatigue. Interim Technical report no. 4, by W. W. Gerberich. Syracuse University, Metallurgical Research Laboratories, Syracuse, N. Y. June 59. Contract AT(30-1)-2141. 45p. Order from LC. Mi $3.30, ph $7.80. AECU-4722

Isotopic method for age determination of industrial products. Quarterly progress report for October through December 1959. Goodyear Tire and Rubber Co., Akron, Ohio. 1959. Contract AT(11-1)-719. 52p. Order from LC. Mi $3.60, ph $9.30. AECU-4724

Parallel operation of welding generators, by B. H. Butler. E. I. du Pont de Nemours & Co., Explosives Dept., Atomic Energy Div., Technical Div., Savannah River Laboratory, Aiken, S. C. June 60. Contract AT(07-2)-1. 11p. Order from OTS. 50 cents. DP-482

Fabrication of the type "E" fluorine cell tank, by B. W. Clark. Union Carbide Nuclear Co., Div. of Union Carbide Corporation, Paducah, Ky. May 60. Contract W-7405-eng-26. 23p. Order from OTS. 75 cents. KY-326

OMR finned fuel plate, by R. R. Hargrove and C. R. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. Jan 58. 10p. Order from LC. Mi $2.40, ph $3.30. NAA-SR-Memo-2354

Stresses in contoured nozzles when subjected to external loadings. Period covered October 16, 1958 to September 15, 1959, by D. E. Hardenbergh. Pennsylvania State University, University Park, Pa. Sep 59. Contract AT(30-1)-1874. 85p. Order from LC. Mi $4.80, ph $13.80. NYO-7565

A sampling device for molten-salt systems, by W. B. McDonald and J. L. Crowley. Oak Ridge National Laboratory, Reactor Projects Division, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 4p. Order from OTS. 50 cents. ORNL-2688

Design, development, and operation of metal-diaphragm reactor-service pumps, by E. C. Hise. Oak Ridge National Laboratory, Reactor Experimental Engineering Division, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 63p. Order from OTS. $2.00. ORNL-2841

An evaluation of solid moderating materials, by T. S. Lundy and E. E. Gross. Oak Ridge National Laboratory, Metallurgy Division and Reactor Projects Division, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 10p. Order from OTS. 50 cents. ORNL-2891

Surface temperatures of irradiated ORR fuel elements cooled in stagnant air, by J. F. Wetts, Jr. Oak Ridge National Laboratory, Operations Div., Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 13p. Order from OTS. 75 cents. ORNL-2892

Fission product distribution in ORR fuel elements, by A. L. Colomb. Oak Ridge National Laboratory, Operations Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 7p. Order from OTS. 50 cents. ORNL-2897

Photoneutrons and the control of a pool-type reactor, by A. L. Colomb. Oak Ridge National Laboratory, Operations Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 8p. Order from OTS. 50 cents. ORNL-2898

Development of an electrolytic cell for removal of nickel from HRT fuel solutions, by E. L. Youngblood. Oak Ridge National Laboratory, Chemical Technology Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 21p. Order from OTS. 75 cents. ORNL-2923

Tolerances of position and form, including MMC, by Sandia Corporation, Albuquerque, N. Mex. Sep 55. 54p. Order from OTS. $1.25. SC-7016 (SP)

Environmental testing to 2000°F, by J. A. Barber. Sandia Corporation, Albuquerque, N. Mex. June 59. 16p. Order from OTS. 75 cents. SCR-96

How positional tolerancing clarifies design intent and reduces product cost, by E. S. Roth. Sandia Corporation, Albuquerque, N. Mex. Jan 60. 41p. Order from OTS. $1.25. SCR-154

The work ratio system, by C. J. McGarr. Sandia Corporation, Albuquerque, N. Mex. July 60. 14p. Order from OTS. 50 cents. SCT-220

An analysis of general stores investment, by R. M. Allan, and P. H. Arnold. Sandia Corporation, Albquerque, N. Mex. Mar 60. 51p. Order from OTS. $1.50. SCTM-72-60(34)

Crystal accelerometer response to mechanical shock impulses, by A. F. Lawrence. Sandia Corporation, Albuquerque, N. Mex. Aug 56. 10p. Order from OTS. 50 cents. SCTM-168-56-16

Application of thin printed wiring laminate in electronic packaging, by G. Voida. Sandia Corporation, Albuquerque, N. Mex. Jan 57. 38p. Order from LC. Mi $3.00, ph $6.30. SCTM-279-56-14

Geology and Mineralogy

A preliminary study of the potential to kinetic energy conversion process in the stratosphere, by R. M. White and G. F. Nolan. Massachusetts Institute of Technology, Cambridge, Mass. Sep 59. Contract AT(30-1)-2241. 12p. Order from LC. Mi $2.40, ph $3.30. AECU-4556

Operation PRE-gnome. Seismic data from natural phenomena and high-explosive tests near Carlsbad, New Mexico, by D. S. Carder and others. Coast and Geodetic Survey, Washington, D. C. Jan 60. Contract AT(29-2)-746. 45p. Order from LC. Mi $3.30, ph $7.80. AECU-4625

Comparison of seismic shock in salt and tuff, by P. E. Byerly. Geological Survey, Washington, D. C. Oct 59. 10p. Order from LC. Mi $1.80, ph $1.80. TEM-1034

Health and Safety

Sr^{90} Monitoring at the Savannah River Plant, by F. E. Butler. E. I. du Pont de Nemours & Co., Explosives Dept., Atomic Energy Div., Technical Div., Savannah River Plant, Aiken, S. C. May 60. Contract AT(07-2)-1. 37p. Order from OTS. $1.00. DP-473

Surface dosage rate studies of Task III Feed Materials, by F. L. Helgeson. General Electric Co., Hanford Atomic Products Operation, Richland, Wash. Apr 54. Decl. March 15, 1960. Contract W-31-109-Eng-52. 25p. Order from LC. Mi $2.70, ph $4.80. HW-31522

Quarterly progress report Research and development activities in the field of radiological sciences October - December 1959, by Members of the Staff. Hanford Atomic Products Operation, Richland, Wash. Jan 60. Contract AT(45-1)-1350. 37p. Order from OTS. $1.25. HW-63643

Evaluation of radiological conditions in the vicinity of Hanford for 1959, by R. L. Junkins and others. Hanford Atomic Products Operation, Richland, Wash. May 60. Contract AT(45-1)-1350. 123p. Order from OTS. $2.50. HW-64371

Evaluation of radiological conditions in the vicinity of Hanford January through March - 1960, by E. C. Watson and others. Hanford Atomic Products Operation, Richland, Wash. May 60. Contract AT(4501)-1350. 45p. Order from OTS. $1.25. HW-65534

Neutron tissue dose survey for the little EVA critical assembly, by M. J. Engelke, B. B. Riebe, and J. A. Sayeg. The University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Aug 60. Contract W-7405-ENG-36. 14p. Order from OTS. 50 cents. LA-2425

A study of Nevada Test Site wind variability, by J. W. Reed. Sandia Corporation, Albuquerque, N. Mex. Mar 58. 51p. Order from OTS. $1.50. SC-4144(TR)

Comparison of fallout doses from Nevada Tests (Revised), by J. W. Reed. Sandia Corporation, Albuquerque, N. Mex. June 60. 46p. Order from OTS. $1.50. SC-4414(RR)

Factors influencing the biological fate and persistence of radioactive fall-out, by R. C. Lindberg and others. University of California of Los Angeles, School of Medicine, Department of Laboratories of Nuclear Medicine and Radiation Biology, Los Angeles, Calif. Jan 59. 78p. Order from OTS. $1.75. WT-1177

Measuring and monitoring training exercise: Foodstuffs, by H. J. McConnell and others. Food and Drug Administration, Department of Health, Education, and Welfare, Washington, D. C. Dec 59. 28p. Order from OTS. 50 cents. WT-1498

Instruments

Magnetic recorder for nuclear pulse application. Period covered: December 6, 1959 to February 5, 1960, by G. M. Burgwald and R. M. Norton. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. Feb 60. Contract AT(11-1)-702. 8p. Order from LC. Mi $1.80, ph $1.80. ARF-1151-4

Development of a fuel-element leak-detection system based on the principle of isotopic exchange, by J. E. Howes, Jr., T. S. Elleman, and D. N. Sunderman. Battelle Memorial Institute,

Columbus, Ohio. Aug 60. Contract W-7405-eng-92. 17p. Order from OTS. 50 cents. BMI-1432

Accurate micrometer for corrosion samples, by W. J. Woodward. E. I. du Pont de Nemours & Co., Explosives Dept., Atomic Energy Div., Technical Div., Savannah River Laboratory, Aiken, S. C. June 60. Contract AT(07-2)-1. 10p. Order from OTS. 50 cents. DP-488

Medium-level continuous alpha air monitor, by M. O. Rankin. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. June 59. Contract W-31-109-Eng-52. 27p. Order from LC. Mi $2.70, ph $4.80. HW-56487(Rev.)

Stainless-inconel metal sorting device, by G. E. Martin. Knolls Atomic Power Laboratory, Schenectady, N. Y. Mar 59. Contract W-31-109-ENG-52. 6p. Order from LC. Mi $1.70, ph $1.80. KAPL-M-GEM-1

Development of temperature protective circuits for the HNPF fuel channel exit, by D. E. Brown. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 18p. Order from OTS. 50 cents. NAA-SR-5313

Interim report on investigation of dynamic characteristics of relays. This report covers the period 1 November to 31 December, 1959. Sandia Corporation, Albuquerque, N. Mex. June 60. 90p. Order from OTS. $2.25. SC-4422(RR)

Theoretical characteristics of several fluid- metering instruments, by M. D. Bennett. Sandia Corporation, Albuquerque, N. Mex. Apr 60. 51p. Order from OTS. $1.50. SC-4446(RR)

Radar return from the vertical for ground and water surfaces, by C. S. Williams, Jr., C. H. Bidwell and D. M. Gragg. Sandia Corporation, Albuquerque, N. Mex. Apr 60. 93p. Order from OTS. $2.25. SCR-107

Metallurgy and Ceramics

Progress letter no. 11 for January 1, 1960 through January 31, 1960, by E. H. Baron. Stevens Institute of Technology, Hoboken, N. J. Feb 60. Contract AT(30-1)-2258. 5p. Order from LC. Mi $1.80, ph $1.80. AECU-4695

Corrosion of plutonium alloys in NaK, by H. H. Hyman and J. J. Katz. Argonne National Laboratory, Lemont, Ill. July 53. Decl. March 15, 1960. Contract W-31-109-eng-38. 10p. Order from LC. Mi $1.80, ph $1.80. ANL-5090

The fabrication of a plutonium helix for a doppler experiment. Work completed September 1956, by R. J. Dunworth, H. V. Rhude and L. R. Kelman. Argonne National Laboratory, Lemont, Ill. Feb 58. Decl March 15, 1960. Contract W-31-109-eng-38. 15p. Order from LC. Mi $2.40, ph $3.30. ANL-5842

The transformation temperatures of high-purity uranium, by B. Blumenthal, J. E. Baumrucker, and L. T. Lloyd. Argonne National Laboratory, Argonne, Ill. June 60. Contract W-31-109-eng-38. 30p. Order from OTS. 75 cents. ANL-5957

Tests of defected thoria-urania fuel specimens in EBWR, by R. F. S. Robertson. Argonne National Laboratory, Argonne, Ill. May 60. Contract W-31-109-eng-38. 87p. Order from OTS. $2.00. ANL-6022

Aqueous corrosion of magnesium alloys, by S. Greenberg and W. E. Ruther. Argonne National Laboratory, Argonne, Ill. May 60. Contract W-31-108-eng-38. 18p. Order from OTS. 50 cents. ANL-6070

Metallography of aluminum and some aluminum-1 w/o nickel alloys, by R. K. Hart and M. J. Heyduk. Argonne National Laboratory, Argonne Ill. June 60. Contract W-31-109-eng-38. 26p. Order from OTS. 50 cents. ANL-6144

Characteristics of anodic and corrosion films on zirconium, by R. D. Misch. Argonne National Laboratory, Argonne, Ill. May 60. Contract W-31-109-eng-38. 25p. Order from OTS. 50 cents. ANL-6149

Preparation of magnesium oxide refractories, by R. C. Lied. Argonne National Laboratory, Argonne, Ill. July 60. Contract W-31-109-eng-38. 14p. Order from OTS. 50 cents. ANL-6164

Combustibility studies with nicrhome V (80 Ni - 20 Cr), by J. B. Conway and R. D. McLay. General Electric Co. Aircraft Nuclear Propulsinn Dept., Cincinnati, Ohio. Dec 54. Decl. November 20, 1959. 33p. Order from LC. Mi $3.00, ph $6.30. APEX-252

Effects of ternary additions on aluminum-35 w/o uranium alloys, by N. E. Daniel, E. L. Foster and R. F. Dickerson. Battelle Memorial Institute, Columbus, Ohio. Oct 59. Decl. February 3, 1960. Contract W-7405-eng-92. 31p. Order from LC. Mi $3.00, ph $6.30. BMI-1388

Progress relating to civilian applications during May, 1960, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. July 60. 99p. Order from OTS. $2.25. BMI-1442 (Rev.)

Experiments to determine the radiation stability of UN dispersions in stainless steel, by J. E. Gates and others. Battelle Memorial Institute, Columbus, Ohio. June 60. Contract W-7405-eng-92. 29p. Order from OTS. 75 cents. BMI-1446

Progress relating to civiliam applications during June, 1960, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. July 60. Contract W-7405-eng-92. 104p. Order from OTS. $2.50. BMI-1448 (Rev.)

Factors affecting the ductility of iron-chromium-aluminum alloy sheet, by R. W. Endebrock, E. L. Foster, Jr., and R. F. Dickerson. Battelle Memorial Institute, Columbus, Ohio. July 60. 24p. Order from OTS. 75 cents. BMI-1450

The bonding of molybdenum- and niobium-clad fuel elements, by S. J. Paprocki, E. S. Hodge, P. J. Gripshover. Battelle Memorial Institute, Columbus, Ohio. July 60. Contract W-7405-eng-92. 61p. Order from OTS. $1.50. BMI-1451

Irradiation effects on massive uranium monocarbide, by A. W. Hare and F. A. Rough. Battelle Memorial Institute, Columbus, Ohio. July 60. Contract W-7405-eng-92. 28p. Order from OTS. 75 cents. BMI-1452

Apparatus for the study of fission-gas release from fuels during postirradiation heating at temperatures up to 1600 C, by R. H. Barnes and D. N. Sunderman. Battelle Memorial Institute, Columbus, Ohio. July 60. Contract W-7405-eng-92. 12p. Order from OTS. 50 cents. BMI-1453

Preparation and evaluation of aluminum-35 w/o uranium alloys containing up to 3 w/o tin or zirconium, by N. E. Daniel, E. L. Foster, Jr., and R. F. Dickerson. Battelle Memorial Institute, Columbus, Ohio. July 60. Contract W-7405-eng-92. 28p. Order from OTS. 75 cents. BMI-1454

The solution susceptibilities of refractory metals in molten plutonium, by F. W. Schonfeld. Los Alamos Scientific Laboratory, N. Mex. June 52. Decl. March 15, 1960. 9p. Order from LC. Mi $1.80, ph $1.80. CMR-5-1365

A sonic test for preferred orientation in Hanford fuel element cores, by A. A. Ferguson and E. C. Wood. General Electric Co. Hanford Atomic Co., Hanford Atomic Products Operation, Richland, Wash. Jan 55. Decl. December 3, 1959, Contract W-31-109-Eng-52. 22p. Order from LC. Mi $2.70, ph $4.80. HW-33024

Calcium uranium (IV) fluoride: Precipitation and reduction to metal, by W. B. Tolley. General Electric Co., Hanford Atomic Products Operation, Richland, Wash. Mar 55. Decl. January 12, 1960. Contract W-31-109-Eng-52. 14p. Order from LC. Mi $2.40, ph $3.30. HW-35815

The effect of oxidation on the compression strength of CS-GBF graphite, by B. Griggs. General Electric Co., Hanford Atomic Products Operation, Richland, Wash. Apr 56. Decl. January 8, 1960, 12p. Order from LC. Mi $2.70, ph $4.80. HW-42498(Del.)

The irradiation of thin evaporated films of uranium dioxide. Interim report, by T. K. Bierlein and B. Mastel. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Sep 59. Contract AT(45-1)-1350. 17p. Order from LC. Mi $2.40, pn $3.30. HW-61656

A report of results of tests on impervious graphite and discussions by: L. N. Johanson, R. J. Campbell, and E. E. Mueller. University of Washington, Seattle, Wash. Mar 58. 47p. Order from LC. Mi $3.30, ph $7.80. HW-61820

Some metallographic observations on thorium metal, by D. T. Peterson. Ames Laboratory, Iowa State University of Science and Technology, Ames, Iowa. June 60. Contract W-7405-eng-82. 11p. Order from OTS. 50 cents. IS-155

Improved welding techniques for SER fuel element assembly closures, by S. Elchyshyn. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 30p. Order from OTS. 75 cents. NAA-SR-4909

Direct observation of fast neutron damage in gold films, by A. Grenall. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 18p. Order from OTS. 75 cents. NAA-SR-5062

Fuel element development for Piqua OMR, by M. H. Binstock. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 52p. Order from OTS. $1.25. NAA-SR-5119

Hot pressure bonding of OMR tubular fuel elements, E. E. Garrett, G. V. Alm and M. H. Binstock. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 47p. Order from OTS. $1.00. NAA-SR-5120

A heat transfer control device for irradiation experiments, by W. K. McCarty and R. C. Noyes. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 10p. Order from OTS. 50 cents. NAA-SR-5141

Process development of uranium carbide fuel slugs for HNPF, by D. H. Turner. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. July 60. Contract AT(11-1)-GEN-8. 26p. Order from OTS. 50 cents. NAA-SR-5346

Development of pass schedule for rolling narrow uranium strip, by J. F. Schiltz and J. W. Magoun. National Lead Company, Cincinnati, Ohio. June 58. Decl. November 30, 1959. Contract AT(30-1)-1156. 23p. Order from LC. Mi $2.70, ph $4.80. NLCO-756

The development and testing of the UO_2 fuel element system. Progress report for period September 1 through December 31, 1959, by B. E. Murtha. Combustion Engineering, Inc. Nuclear Division, Windsor, Conn. 1959. Contract AT(30-1)-2379. 157p. Order from OTS. $2.75. NYO-9006

High energy storage ceramic capacitor. Final report, by P. H. Klein and others. General Electric Co., Electronics Laboratory, Syracuse, N. Y. and General Electric Co., Missile and Space Vehicle Department, Philadelphia, Pa. Feb 60. Contract AT(30-1)-1963. 96p. Order from OTS. $2.25. NYO-9076

Metallurgy Division semiannual progress report for period ending April 10, 1954, by W. H. Bridges. Oak Ridge National Laboratory, Oak Ridge, Tenn. Aug 54. Decl. with deletions December 1, 1959. Contract W-7405-eng-26. 120p. Order from LC. Mi $6.30, ph $19.80. ORNL-1727(Del. 2)

Relaxation characteristics of inconel at elevated temperatures, by C. R. Kennedy and D. A. Douglas. Oak Ridge National Laboratory, Oak Tenn. Feb 60. Contract W-7405-eng-26. 28p. Order from LC. Mi $2.70, ph $4.80. ORNL-2407

Metallurgy Division annual progress report for period ending September 1, 1959. Oak Ridge National Laboratory, Oak Ridge, Tenn. Dec 59. Contract W-7405-eng-26. 352p. Order from LC. Mi $11.10, ph $37.80. ORNL-2839

Columbium clad uranium carbide fuel element contract. Monthly letter report for September 1 through September 30, 1959. Union Carbide Metals Co., Niagara Falls, N. Y. Sep 59. Contract AT(40-1)-2559. 2p. Order from LC. Mi $1.80, ph $1.80. ORO-229

Research on piezoelectric materials and phenomena. Final report for February 1, 1959 through January 31, 1960, by D. A. Berlincourt. Sandia Corporation, Albuquerque, N. Mex. July 60. 164p. Order from OTS. $3.00. SC-4443(RR)

Quarterly technical progress report for period ending March 31, 1960, by J. L. Zambrow. Sylvania-Corning Nuclear Corporation, Bayside Long Island, N. Y. May 60. Contract AT-30-1-GEN-366. 42p. Order from OTS. $1.00. SCNC-309

Metallurgy information meeting, Ames Laboratory, Iowa State College, May 2, 3, and 4, 1956. Ames Laboratory, Ames, Iowa. 1956. Decl. October 7, 1959. 18p. Order from LC. Mi $2.40, ph $3.30. TID-7526(Pt. 7)

Corrosion of D loop, by H. K. Lembersky and P. Cohen. Westinghouse Electric Corporation, Atomic Power Division, Pittsburgh, Pa. Oct 55. Decl. with deletions November 20, 1957. 15p. Order from LC. Mi $2.40, ph $3.30. WAPD-CP-715(Del.)

Heat transfer effects on the corrosion of zirconium and some alloys, by L. A. Waldman and P. Cohen. Westinghouse Electric Corporation, Atomic Power Division, Pittsburgh, Pa. May 54. Decl. with deletions March 14, 1957. Contract 11-1-GEN-14. 32p. Order from LC. Mi $3.00. ph $6.30. WAPD-MDM-8(Del.)

Back extrusion of Zircaloy-2 lower extension brackets, by J. G. Seton. Westinghouse Electric Company, Bettis Plant, Pittsburgh, Pa. Dec 55. 19p. Order from LC. Mi $2.40, ph $3.30. WAPD-SFR-Fe-355

A method for hot-pressing large diameter beryllium oxide rings, by L. M. McLaughlin and A. H. Ballard. Union Carbide Nuclear Company, Division of Union Carbide Corporation, Y-12 Plant, Oak Ridge, Tenn. Aug 60. Contract W-7405-eng-26. 15p. Order from OTS. 50 cents. Y-1302

Nuclear Explosions—Peaceful Applications

Blanca--A study of the maximum vertical earth motion of the Mesa slope, by D. Barnes and S. Finos. Edgerton, Germeshausen & Grier, Inc., Las Vegas, Nev. Feb 60. 16p. Order from OTS. 75 cents. AECU-4681

Nuclear explosives and landslide dams, by R. H. Carlson. Sandia Corporation, Albuquerque, N. Mex. Apr 60. 95p. Order from OTS. $2.25. SC-4403(RR)

Geologic studies of underground nuclear explosions Rainier and Neptune. Final report, by T. L. Thompson and J. B. Misz. University of California, Lawrence Radiation Laboratory, Livermore, Calif. Oct 59. Contract W-7405-eng-48. 58p. Order from OTS. $1.75. UCRL-5757

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General reactor analysis computer program for the IBM 704, program George, by T. A. Hoffman and W. B. Henderson. General Electric Co., Atomic Products Division, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Oct 59. Contracts AT(11-1)-171 and AF 33(600)-38062. 361p. Order from OTS. $5.00. APEX-543

Liquid metal fuel reactor experiment: Operation and testing of a nonnuclear liquid-metal system, by the Babcock and Wilcox Company, Lynchburg, Va. May 60. Contract AT(30-1)-1940. 145p. Order from OTS. $3.00. BAW-1192

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A P-9 multigroup method for solution of the transport equation in slab geometry, by R. C. Gast. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. May 60. Contract AT-11-1-GEN-14. 39p. Order from OTS. $1.25. WAPD-232

Technical progress report: reactor physics and mathematics for the period March 1 to June 1, 1960, by P. N. Ross. Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Pittsburgh, Pa. 1960. Contract AT-11-1-GEN-14. 122p. Order from OTS. $2.50. WAPD-MRJ-10

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Shearing irradiated uranium plates, by W. Scott and others. E. I. du Pont de Nemours & Co. Explosives Department, Atomic Energy Division, Technical Division, Savannah River Laboratory, Aiken, S. C. Nov 56. Contract AT(07-2)-1. Decl. July 27, 1960. 20p. Order from OTS. 30 cents. DP-185

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Quarterly progress report research and development activities fixation of radioactive residues, October through December, 1959, by D. W. Pearce. Hanford Atomic Products Operation, Richland, Wash. Jan 60. Contract AT(45-1)-1350. 20p. Order from OTS. 75 cents. HW-63949

Study of real gas and heat transfer effects on the design of hotshot wind tunnels, by J. R. Stalder, M. W. Rubesin, and D. K. Eberly. Sandia Corp., Albuquerque, N. Mex. Mar 60. 77p. Order from OTS. $2.25. SCR-166

Reactors—General

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Burnup calculation method for non-uniform flux and/or for movable fuel, by R. T. Shanstrom.

General Atomic Division. General Dynamics Corporation, San Diego, Calif. July 58. 15p. Order from LC. Mi $2.40, ph $3.30.
AECU-4489

Studies of reactor containment. Monthly technical progress report no. 29 for September 1, 1959 through September 30, 1959, by T. A. Zaker. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. Oct 59. Contract AT(11-1)-528. 4p. Order from LC. Mi $1.80, ph $1.80.
AECU-4599

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BAW-109

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BMI-1406

Effect of non-thermal capture on Californium production in the HFIR, by H. C. Claiborne. Oak Ridge National Laboratory, Oak Ridge, Tenn. Dec 59. 12p. Order from LC. Mi $2.40, ph $3.30.
CF-59-12-16

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KAPL-2000-10

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NAA-SR-Memo-4493

Reactor safety quarterly progress report for August to October 1954, by N. E. Huston, North American Aviation, Inc, Downey, Calif. Apr 55. Decl. July 20, 1959. Contract AT-11-1-GEN-8. 43p. Order from LC. Mi $3.30, ph $7.80.
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Heterogeneous reactor calculation methods. Quarterly progress report no. 2 for July 1 to September 30, 1959, by C. N. Klahr and L. B. Mendelsohn. TRG, Inc., Syosset, N. Y. 1959. Contract AT(30-1)-2375. 54p. Order from LC. Mi $3.60, ph $9.30. NYO-2674

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A transistorized reactivity measurement system, by L. Ehrman. Sandia Corporation, Albuquerque, N. Mex. July 60. 28p. Order from OTS. 75 cents. SCTM-190-60(14)

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Nuclear materials control system (NMCS). Phase II: Assay capabilities of a reactor fuels measuring facility, by J. A. Vreeland. Westinghouse Electric Corporation, Atomic Power Department, Pittsburgh, Pa. Dec 59. Contract AT(30-1)-2176, Task I. 49p. Order from LC. Mi $3.30, ph $7.80. WCAP-6041

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Reactivity lifetime. Section I. Third performance, 2797-3797 EFPH. Core I. Seed I. Duquesne Light Company, Shippingport, Pa. Nov 59. 42p. Order from LC. Mi $3.30, ph $7.80. AECU-4511

Periodic radiation survey. Section I. EFPH-4182. First performance. Core I. Seed I. Duquesne Light Company, Shippingport, Pa. Nov 59. 7p. Order from LC. Mi $1.80, ph $1.80. AECU-4512

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Periodic intercalibration of temperature sensing elements. Section I. Second performance. Nov 59. 28p. Order from LC. Mi $2.70, ph $4.80. AECU-4515

Dynamic response of reactor plant to load changes. Section I. First performance. Core I. Seed I. Duquesne Light Co., Shippingport, Pa. Nov 59. 27p. Order from LC. Mi $2.70, ph $4.80. AECU-4516

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Station radiation level survey. Section II. Fifth performance. Core I, Seed I. Duquesne Light Co., Shippingport, Pa. Nov 59. 9p. Order from LC. Mi $1.80, ph $1.80. AECU-4521

Control air conditions at the reactor chamber. Section I. Duquesne Light Co., Shippingport, Pa. Nov 59. 6p. Order from LC. Mi $1.80, ph $1.80. AECU-4522

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Technical review of ZPR-I accidental transient--The power excursion, exposures, and clinical data, by R. O. Brittan and others. Argonne National Laboratory, Lemont, Ill. Jan 53. Decl. March 28, 1957. Contract W-31-109-eng-38. 132p. Order from LC. Mi $6.90, ph $21.30. ANL-4971

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Heavy water moderated power reactors. Progress report for January 1960, by D. F. Babcock and others. E. I. du Pont de Nemours & Co. Explosives Department, Atomic Energy Division, Technical Division, Wilmington, Del. Mar 60. Contract AT(07-2)-1. 41p. Order from OTS. $1.25. DP-465

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Experimental PRTR moderator flow distribution results, by M. R. Kreiter. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Jan 59. 13p. Order from LC. Mi $2.40, ph $3.30. HW-58743

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